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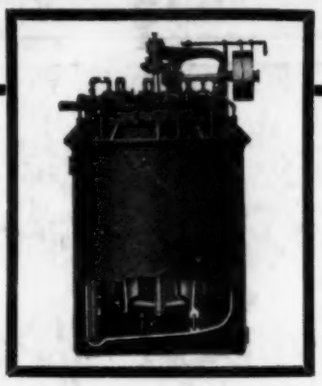

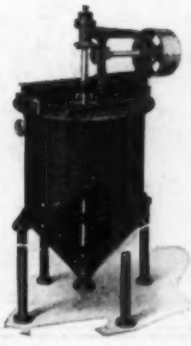

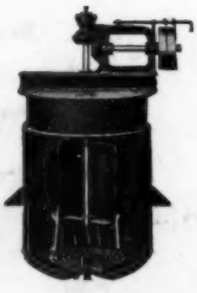

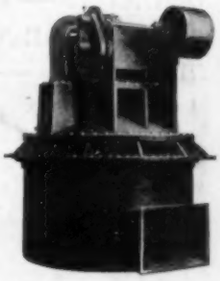

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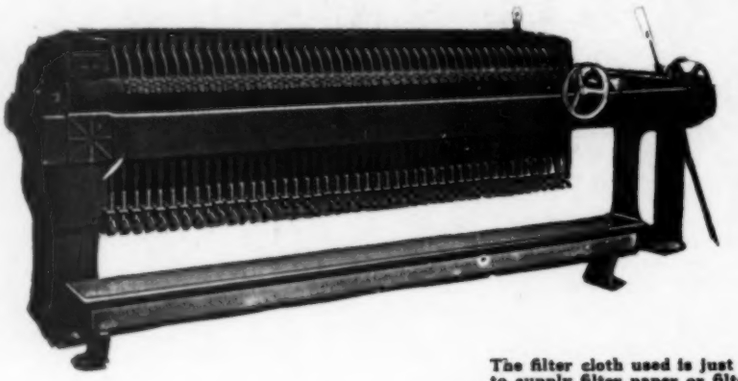

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CHEMICAL & METALLURGICAL ENGINEERING

A consolidation of
ELECTROCHEMICAL & METALLURGICAL INDUSTRY *and* IRON & STEEL MAGAZINE
H. C. PARMELEE, Editor

Volume 28 — New York, April 23, 1923 — *Number* 16

Intelligent Caution Or Careless Ignorance

NEWSPAPERS recently featured a tragedy in Chicago in which six persons died in a flat in consequence of the seepage of fumes of hydrocyanic acid gas from a restaurant on another floor, which was being fumigated. The reporter described the insecticide thus: "It is made of cyanide of sodium, sulphuric acid and water. The combination forms a substance that eats up the oxygen and hydrogen in air, leaving only a poisonous gas." Blatant ignorance of the characteristics of the poison, however, was not confined to the narrator of the event; the account showed that the fumigation was being directed by an individual who styled himself the manager of the National Hygienic Corporation of Buffalo! The history of the disaster was traced back to the dissemination of pamphlets throughout the city. When apprehended, the director of the enterprise is reported to have affirmed that the gas used was non-poisonous. He was held by the police on a charge of criminal negligence; to us it would seem to have been a case of criminal ignorance.

The inculcation of fear in the public mind as to the effects of the so-called deadly poisons is detrimental to the progress of civilization. Cowardice is the father of superstition, and superstition is the antithesis of science. Knowledge and familiarity in the handling of the products of science are all that are needed to insure their full utilization for the benefit of humanity. Popular prejudices must be overcome by education. The drawback to hydrocyanic acid as an insecticide has been due almost entirely to the slipshod methods of preparation by those who are inexperienced in the handling of chemicals and ignorant of their effects. The combination of sodium cyanide and sulphuric acid leaves a residuum that invites accident. The use of liquid hydrocyanic acid leaves no residuum; in experienced hands, it is a safe and efficient insecticide. Its extended use in the near future for the extermination of pests from fruit trees will mark a new phase in the science of horticulture.

The fact that familiarity with poisons is the best insurance against accident is exemplified in the history of the cyanide process for the recovery of gold and silver from ores. When JOHN STEWART MACARTHUR developed a practicable scheme of operations for the use of potassium cyanide as the solvent, many were the apprehensions that its use in large plants would lead to frequent accident and heavy loss of life. As a matter of fact, the opposite was the result. The number of poisonings that have occurred in cyanide plants, despite the world-wide application of this method of hydrometallurgical extraction, has been negligible. The death rate is as low as or lower than in any other industry that is considered to be free of appreciable hazard. This result has come about because of a wide education in the properties and effects of cyanide.

The so-called accidents that happen from time to time are often the effects of ignorance or carelessness, sometimes both. Intelligent technicians are conquering the inanimate world; and those bolder spirits are deserving of credit who can make fire and flood and poison the servants, rather than the masters, of humanity. But until that happy day arrives we shall persist in demanding that those who offer to serve the public with chemical products shall not only use them intelligently but also safeguard the people against the results of carelessness or ignorance.

A Week of Paper and Pulp

APRIL 9 to 14 was a history-making week for the pulp and paper industry. Many healthy signs of the times were in evidence at the meetings of the American Paper and Pulp Association and its affiliated societies which were held in New York coincident with the Paper Industries Exposition. Perhaps the most encouraging development to the technologist was the changing attitude toward industrial research, which is paralleling the paper industry's trend away from rule-of-thumb operation and unscientific methods. Other signs of progress are to be seen in the increasing interest in process efficiency and in the war on waste both in production and distribution.

The Technical Association of the Pulp and Paper Industry—known more familiarly as TAPPI—has had a large part in co-ordinating and directing the research activities of the industry. By standardizing processes and materials, defining units of measurement and establishing fixed objectives in its experimental work, the association is putting paper research on a comparative basis and making its results intelligible and of value to investigators in other plants and other fields.

The Paper Industries Exposition, the first of the kind ever held, proved its worth quite convincingly. By bringing together under one roof all the interests of the industry—from standing tree to a highly fabricated paper product—the exposition acted as an effective means of demonstrating the intrarelations of the industry and the dependence of the different branches upon one another. Production men carried away many practical ideas from the equipment exhibits. The purchasing and marketing men exchanged views and learned of latest developments in their respective fields. And not the least important was the educational value to the public, for all who came in contact with the exposition went away with a keener appreciation of the importance of America's seventh industry and its essential rôle in modern life and progress.

Pekinese Or Pekiner?

OUR late editorial comment on an excellent method of teaching chemistry in China has called forth a protest from an esteemed Chinese reader. The offence consisted in the quotation from BRET HARTE'S poem to the effect that "the heathen Chinee is peculiar." We hasten to assure all readers from the Orient that no offence was intended. The adjective heathen has lost its sting to many of us, and we believe the subject debatable whether it is not better to be a heathen than a member of the Ku Klux Klan, which boasts of something like 120 per cent Americanism. To be peculiar is really a virtue, and we cherish the hope that we are a bit peculiar ourselves—at least enough so to be individual.

About the expressions Chinee and Chinaman, to which our correspondent objects, we are a little bewildered, because Chinese, which is the term he approves, properly speaking is an adjective, and we are at a loss for a good noun to indicate a native of China. True, American is both an adjective and a noun, because custom makes it so, and in time it may be the same for Chinese. If a better contemporary substantive than Chinaman is suggested we promise to be good and to use it, so long as it accords with our literary conscience. We have immense admiration for people and things Chinese, and we want to be set right in this matter. We want to make friends among them, not enemies. We acknowledge frankly our lack of the Oriental slant in expression. For instance, we should hesitate to refer to a gentleman from Pekin as Pekinese, on account of the infernal little dogs that women carry about and which are called Pekinese. What should we call him? Would Pekinian do? We call a man from New York a New Yorker, but if we call one from Pekin a Pekiner that would be German, not English. We're in a quandary. We're doing our best, and we seek enlightenment.

Researching the Staff of Life

ON ANOTHER page there is indicated, in an article on baking, the practical, dollar value of engaging in research, even as pioneers. Here was a household art, developed into a major industry which was supposed to have its beginning and its end in kitchen culture. Twenty years ago there was no one less welcome in a bakery than the chemist. So long as ignorance reigns we think we know it all, but as soon as we begin to prosecute research intelligently the problems spring up as did the fabled warriors when dragons' teeth were sown. Now, in this baking industry, research has only begun. The baker with scientific curiosity has questions enough to baffle the wisest of us. Here are a few of his inquiries:

He would like to ferment his dough in the pan—that is, to ferment each loaf separately. The yeast plant converts into alcohol and CO_2 about 4 per cent of the dry material used, and any reduction of this waste of flour and sugar would be worth while. By fermenting in the pan it might be accomplished.

The problem of the flavor of bread needs better control. Knowing how to make it good and agreeable to the taste is far from a complete solution. If he only knew why it has the desired flavor he would be in a position to make all kinds of bread taste better. This would be an important contribution to economics. A bushel of wheat is converted into food and fuel to the extent of 90 per cent of its weight. A cow will convert 18 per cent of wheat or grain into milk, the pig 15½ per cent into pork, hens 5 per cent into eggs, and fowls a little over 4 per cent into dressed poultry. The amount of bread eaten is determined even more by its tastiness than by its nutritive value.

The baker needs to know more than he does of the effect of moisture on the baking and keeping qualities of flour. And what is the physical effect of mixing dough? Different types of flour require different degrees and periods of mixing. This fact is determined by tests, but what's the chemistry of it? There is a relationship between the hydrogen-ion concentration of dough and its requirements as to mixing, but what is that relationship?

What is the actual function of shortening—i.e., of the fats used in baking? What is the proper protein content of bread, and which proteins are most wholesome and most desirable? What are the changes that take place in canned eggs, more especially in reference to their food value? Why does bread deteriorate so rapidly, and how may deterioration be delayed? How may mold be controlled and avoided?

Indian corn or maize lacks gluten, and therefore it does not leaven properly; it cannot be made into a loaf with holes in it. To make a light, tasty cornmeal bread such as that made of wheat or rye would be another real contribution to economics.

And how much heat can cornmeal stand in milling? It is almost always much better if ground between slow-moving burr stones than in a Hungarian roller mill. It appears that the greater velocity and consequent heat of the roller mill injures the flour.

These are merely a few of the many problems that present themselves, but they are far and away from being the complete substance of things hoped for. They are, indeed, merely a few trivial wishes about the portals of research. If bread should ever be made into a ration at once complete, varied and desired by all, as well as healthful for all, we might have a different organization of society as its sequel.

The Portland Cement Industry And Its Association

AN editorial bearing this title appeared in *Chemical & Metallurgical Engineering* on July 26, 1922. It was written after an extended trip during which many executives and engineers connected with the manufacture and use of portland cement were interviewed and was designed to represent a chemical engineer's estimate of the industry and the association.

We believe that recent developments in the industry deserve such comment that a revision of the former editorial is in order. Before discussing this, however, two mistakes have come to our attention in the former editorial. The first was the crediting of the Portland Cement Association with the good work of developing standards for portland cement. As a matter of fact this work was actually done by the American Society for Testing Materials, the confusion arising because many of the committee were prominent in the Portland Cement Association. The second mistake was more serious in its implication than in its statement. "Invariably every improvement in concrete making which

is announced [by the association] indicates the desirability of using more cement [in the mix]. After a certain time this becomes monotonous and then suspicious." Since then recommendations have come to our attention in which the association has advised a smaller quantity of cement than that recommended for the same purpose by the Department of Agriculture and other bodies. Our statement was published with complete confidence in a hitherto reliable source of information. We accept complete responsibility for the error and believe that, while the opinion has following, it is decidedly unfair, being based partly on prejudice and partly upon an unfortunate interpretation of the policy of the Portland Cement Association of giving minimum requirements for cement in concrete specifications, leaving the upper limit open.

There were two main criticisms advanced in the former editorial—criticisms of the cement industry as a whole and of the association as its representative. The first had to do with the grading of cement and the second with the absence of fundamental research in the industry. We believe that the present standard specifications of portland cement are inadequate in that a wide variation in quality can be labeled "standard." These variations are known to many large consumers who purchase on their own specification and to experienced concrete foremen throughout the country, who will frequently designate a brand of cement which will be more desirable for a given type of work. We have therefore in part at least a grading of cement which we believe must become universal and which so far as our acquaintance goes would be unwelcome to the industry, since it would vastly complicate both sales and manufacturing.

With regard to fundamental research we are delighted to be able to withdraw our criticism. In our former editorial we had deplored the absence of fundamental research in the cement industry. "No work was being done to improve the product." We did not mean the more obvious improvements such as uniformity or fineness, but the study of fundamentals such as is carried out in Schenectady in the electrical industry or at Whiting and many other places in petroleum refining. There seemed to be an absence of research vision which would make it comparable to progressive industries. What constituted good cement? What factors improve the quality? What are the limiting percentages of the various constituents? Is it conceivable that other ingredients would be better? There was no interest in such questions.

Now, however, the research laboratory of the association has been instructed to undertake a comprehensive inquiry into the many fundamental questions. Most happily the association has enlisted the co-operation of the Bureau of Standards in this work so that both the producer and the consumer interest will be represented. It means further that the outstanding figures in cement and concrete work will be pulling together for the best interests of all.

Our enthusiasm is kindled and we wish to extend our congratulations upon the splendidly constructive program. It complements the work which the Portland Cement Association has already done toward educating the consumer in the use of concrete. This work has been well conceived and splendidly carried out for a long time.

Henry Ford Works Miracles

THE Associated Press has announced, and the newspapers have been giving the widest publicity to the statement, that HENRY FORD has purchased undeveloped coal lands in Kentucky and that he intends not only to provide for his own fuel requirements by this means but to induce others to join him in his "coal conservation scheme." The scareheads declare that he has a plan "to burn the coal twice" and that "he will ask all industrial users of his coal to install furnaces that will remove only the gas, leaving a fuel unimpaired for domestic purposes. The coal, after the process, would be sold to heat the homes of hundreds of thousands of workers throughout the country. According to a technical explanation of the gas-removing process, the fuel would then be more valuable than ordinary coal for heating." This reminds us of the "Dere Mable" letters. "That's teckenickle, Mable," said the swain, "you wouldn't understand."

It probably takes a publicity bureau to put over a statement like the despatch quoted. Editors do their best to avoid this kind of free advertising, but now and then a blurb of this sort gets through. In this instance the Associated Press and all its subscribers, followed by those who copied the news, have effectively joined to present Mr. FORD as a miracle man who will keep poor folks warm in winter. Many papers which printed this as an item of news would refuse to accept it as an advertisement if their business managers knew how misleading it was. The reason is, of course, that the man of science has no place in a newspaper organization. Without saying so, it appears from the statement that the great HENRY FORD can induce manufacturers generally to equip their plants not only with a gas system but a briquetting outfit as well, or else that he can persuade the "hundreds of thousands of workers throughout the country" to burn coke. Thus far they haven't taken to it any too well. How does he propose to transport his domestic coke? And what argument has he for gas making that the manufacturers of gas equipment have not urged for years? Has he anything new? Not a word is said of his method. All we have is the misleading intimation that he plans to persuade manufacturers to "extract the gas" and that then they will have more heat units left over in the coke than they had in the coal. While not saying so in measured words, it gives the impression that HENRY can do what others cannot do. He may aspire toward conservation, but a more effective and immediate step in this direction would be to redesign the Ford automobile engine so that it consumes less gasoline. Mr. FORD is a genius at making cheap cars and selling them, and at getting rich, but thus far we have not heard of his successful efforts at conservation.

The article goes on to say that he will "devote his energies" to reforestation of the timber lands where he has half a billion feet standing, *without cutting down a single tree.* How can he reforest if he doesn't deforest? Without definitely announcing it, the impression is given that the hills are covered with virgin timber. And it is indicated that half a billion feet are ready for harvesting. If that is true the mature trees should be cut. The only value in letting the timber stand would be to teach Mr. FORD what others know already.

Readers' Views and Comments

An Open Forum for Subscribers

The editors invite discussion of articles and editorials in *Chem. & Met.* or on other topics of pertinent interest

Dirt In Steel

To the Editor of Chemical & Metallurgical Engineering

SIR:—I should like to second most heartily Mr. Epstein's plea, in your issue of March 14, for better preparation of specimens before taking micrographs for publication. Almost any sample of steel, no matter how clean, can be made to look dirty like his Fig. 1 by careless work, and the ease with which erroneous conclusions are arrived at in this way cannot be emphasized too strongly. I congratulate Mr. Epstein on his clear exposition of this point and of the importance of stating the magnification, and it is to be hoped that this article will be brought to the attention of every metallographist in the country.

There is just one criticism which I would make of this excellent contribution, and that is that the statement that a pit invariably forms around each inclusion during polishing is exaggerated. Alumina is the only inclusion which has invariably given this effect in my experience. Sulphides, iron oxide and silicates can be polished without the slightest pitting of the steel around them, and in soft, unhardened steel too. The way to accomplish this is to do as much of the abrasive work as possible with dry emery papers, and to reduce all wet abrasion to the absolute minimum, on a cloth like "duck" without too much "nap." The final polishing with rouge is of course a wet process, but need not cause any pitting.

Two photomicrographs are offered herewith as illustrations of inclusions in unhardened steel which show a few pits within the area of the inclusion (this is indeed often unavoidable unless the inclusions are small), but absolutely no pitting of the steel around the inclusion. The boundary between inclusion and steel is sharp and flat, even in the soft steel. In the writer's opinion there is no excuse for any other result where silicates or sulphides are photographed.

It seems rather unfortunate therefore that the Bureau of Standards should have to admit that it is necessary for it to harden its steel samples to reduce the "invariable" pitting around inclusions. Nevertheless it is to be hoped that the main point of Mr. Epstein's article will not lose anything in force on account of this minor detail in which his methods may seem somewhat open to criticism.

GEORGE F. COMSTOCK.
Metallurgical Engineer,
Titanium Alloy Manufacturing Co.,
Buffalo, N. Y.

The "Modification" of Aluminum-Silicon Alloys

To the Editor of Chemical & Metallurgical Engineering

SIR:—G. W. Walker's comments in the April 9, 1923, issue of *Chem. & Met.* on a particular case of the modification of aluminum-silicon alloys are concerned with an alloy sufficiently different in composition from that described by the writer in *Chem. & Met.*, Aug. 23, 1922, to account for the difference in structure observed.

Mr. Walker's specimen contained iron 1.75 per cent and manganese 0.26 per cent, against iron 0.70 per cent and manganese 0.01 per cent in the material used by the writer.

It seems quite probable that the structure in Mr. Walker's sample is thoroughly modified and that the needles remaining consist of an iron silicide with possibly some similar manganese compound.

These needles are similar to those shown in Figs. 4 and 6 of the article by Jeffries, *Chem. & Met.*, April 19, 1922, representing an alloy of "approximately the same chemical composition—namely, Si 10 per cent, Fe

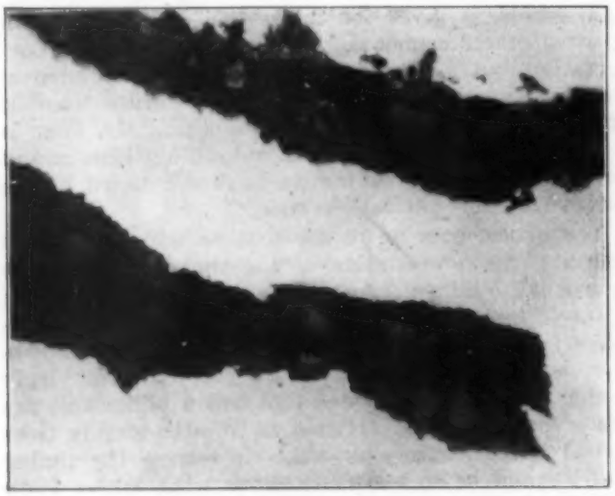


FIG. 1—SLAG IN CENTER OF WEB OF OPEN-HEARTH STEEL RAIL. × 200

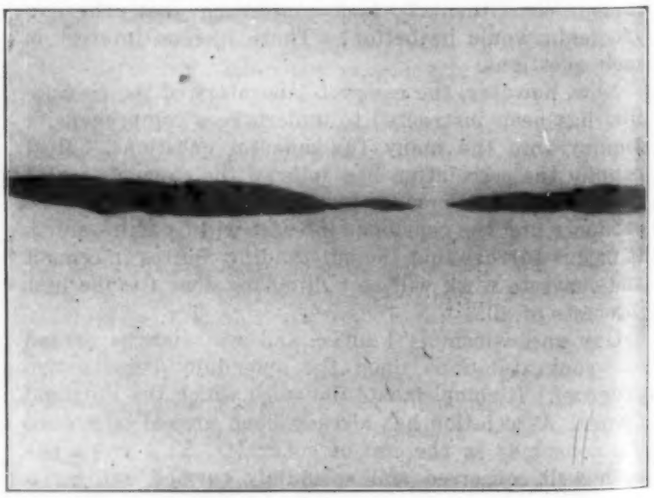


FIG. 2—OXIDE INCLUSIONS IN 0.17 C STEEL WIRE, ABOUT 0.2 IN. DIAMETER. × 200

about 1 per cent." If we choose to consider the "about 1 per cent" as a low estimate, the similarity in both structure and composition becomes more pronounced.

In this connection it is of interest to note in the summary of Jeffries' article: "Iron makes the aluminum-silicon alloys more corrodible and in general weakens and embrittles them." "The greater the amount of silicon used the less is the permissible iron." Also, in a publication of the Aluminum Co. of America, "Silicon-Aluminum Alloys," the following statements and recommendations are made: "The proportion of iron in the alloy should be strictly limited for the best result. Iron forms with silicon an iron silicide, which appears as needles in the microstructure. The modifying treatment has little refining effect on the particle size of this constituent, and its presence tends to reduce the ductility. The alloy as cast should preferably contain not over 0.5 to 0.6 per cent iron." . . . "High-grade ingot should be used in diluting the rich alloy to the required composition, so as to keep the iron content to a minimum. This point is mentioned again, for the highest strength and ductility are developed only when the iron is 0.6 per cent or under, and the rich silicon alloy, although made from a specially pure grade of silicon, may unavoidably contain more iron than 99/100 per cent ingot."

THE HENRY SOUTHER ENGINEERING CO.,
Hartford, Conn JAMES J. CURRAN

The Purpose Of a Standard

To the Editor of Chemical & Metallurgical Engineering

SIR:—Dr. Skinner's article on "Food Standards" is an excellent and forceful presentation of the subject. The fundamental functions of a standard, as applied to chemical products, are also clearly expressed in your editorial. I believe, however, it is worth while to call you attention to the fact that somewhat the same ideas are expressed in the annual report of the director of the Bureau of Standards for the fiscal year ended June 30, 1922. The following paragraphs are pertinent in this connection:

Standards of Quality:

Specifications for material (by description, sample, or both), known as *standards of quality*, fixing in measurable terms a property or group of properties which determine the quality.

The numerical magnitude of each constituent property pertinent to the quality involved, and specific magnitude in units of measure of such significant factors as uniformity, composition, form, structure and others.

Purpose:

To secure *high utility* in the *products* of industry by setting an attainable standard of quality.

To furnish a *scientific basis* for *fair dealing* to avoid disputes or settle differences.

To *promote truthful branding* and *advertising* by suitable standards and methods of test.

To *promote precision* and *avoid waste* in science and industry by affording quality standards by which materials may be made, sold and tested.

A standard of quality for a given material necessarily takes into account the purpose for which the material is to be used. To set the standard too low results in losses, poor efficiency and even loss of life; to make it too high may result precisely in the same thing—that is to say, the material must be suitable for the purpose intended, and the bureau's investigations in connection with the properties of materials are to enable the user of these materials, first, to select intelligently the material best suited for the purpose; second, to specify it in terms which the producer cannot mistake; and third, to make the necessary tests to ascertain whether or not the material supplied is in accordance with the specifications.

As you doubtless know, the Bureau of Standards is also authorized to deal with standards of measurement, standard values of constants, standards of mechanical performance, and standards of practice. These subjects are discussed in the annual report cited.

As an outstanding result of the government's work on standardization, it should be noted that the Federal Specifications Board is bringing about the use of standard specifications by all departments and independent establishments of the government for use in connection with the purchase of the more important materials.

The fundamental functions of a standard will depend on the type of standard in question. The annual report of the director of the Bureau of Standards sets forth the fundamental functions of each type of standard listed above.

F. W. SMITHER.
Bureau of Standards,
Washington, D. C.

Gas in Monel Metal

The Bureau of Standards has just completed determinations of oxygen and hydrogen in samples representing three stages of the deoxidation of Monel metal. The samples were all from 50-lb. blocks cast during the progress of a regular heat: (1) The metal at the time of tapping the furnace before the addition of any deoxidizers; (2) the above metal after the addition of ferromanganese in the ladle, and (3) the above metal after the further addition of magnesium in the ladle—that is, after all additions have been made. Both oxygen and hydrogen in the metal decreased rapidly with the progress of the deoxidation. The finished metal, as represented by the last sample of this heat and by samples of completely deoxidized metal from two other heats, contains from 0.002 to 0.005 per cent oxygen. All samples appear rather porous under a magnification of 100.

A sample of Monel metal prepared as above, except that a portion of the deoxidation was carried out in the furnace, showed no porosity, and no oxygen could be detected. A sample of Monel metal from a Heroult furnace heat which had been completely deoxidized in the furnace likewise was entirely sound and contained no oxygen. Thus of the five samples of finished Monel metal examined, the three which were deoxidized by addition of ferromanganese and magnesium in the ladle were porous and contained from 0.002 to 0.005 per cent oxygen, while the two which were deoxidized entirely or in part in the furnace were sound and contained no oxygen.

Huge New Government Camera

The largest metal camera in the world is located in the Department of the Interior. It weighs 7,000 lb., occupies two complete rooms, takes a picture 1 yd. square and is operated either by electricity or by hand as easily as a tiny kodak in the hands of a tourist. Reorganization of the Interior Department's photographic activities, now in progress, is centered around this mastodon.

The lens, bellows and copy holder are in one room and the plate holder and dark room in the other. Focusing is done by an electrical contrivance which flashes a signal when the proper focus is reached. The 3½-ton giant was designed by A. H. Linsenmeyer, leading photographer of the Geological Survey of the Department of the Interior.

Technical Developments in the British Chemical Industries

Report of Progress in Radiant Heat Utilization, Use of Refractories, and Industrial Applications of Rubber Latex and Colloid Mill

FROM OUR LONDON CORRESPONDENT

RESEARCHES carried out in Great Britain before the war by Prof. W. A. Bone and the late C. D. McCourt on the flameless combustion of combustible gases when mixed with practically the theoretical quantity of air and in contact with special refractory surfaces culminated in the development of a type of boiler which under suitable conditions showed a thermal efficiency of 93 per cent or more. The boiler has been commercially developed both here and in America and successive modifications have brought it to a form quite different from the original form, in which 3-in. tubes were filled with granular refractory material. At present very large units can be supplied with tubes 12 in. in diameter and 20 ft. long and filled with special iron or brick spirals or other packing taking up very little room but sufficient to produce the radiant heat which gives the tube such a high efficiency and an evaporation of up to 20 lb. per sq.ft.

USE OF RADIANT HEAT

Bone and McCourt also developed a refractory diaphragm, the surface of which becomes red hot owing to the flameless combustion of the explosive mixture of gas and air on its surface. These are likely to have application in the chemical industry and for industrial heating operations generally. Thus the evaporation of liquids by radiant heat thrown down on their surfaces and the heat-treatment of any articles passed through a tunnel kiln or kindred heating or drying appliances should be facilitated and rendered more efficient, particularly as the products of combustion consist almost entirely of inert gases, and if necessary a reducing atmosphere can be used. The more general applications that have been developed so far comprise machinery for the baking of biscuit and the making of confectionery, and grillers and toasters for hotels. Other domestic heating operations and more particularly the introduction of highly efficient domestic gas fires and hot plates are foreshadowed and a modification consisting of a granular bed surrounding the furnace or apparatus to be heated enables metallurgical operations and the melting and heat-treatment of metals to be carried out in a convenient and efficient manner. Almost any industrial gases can be used as well as oil or gasoline, and the convenience of such local applications of radiant heat should be useful in many chemical manufacturing operations. It is understood that Professor Bone is preparing one or two scientific papers for the Royal Society of Arts in connection with the development of these methods.

SPALLING OF REFRACTORY BRICKS

Recent investigations have thrown some light on the considerable variation in the life of high-temperature furnace linings. Failures and short life do not necessarily prove that the bricks used were not up to specification and the spalling or progressive splitting away of the brick surfaces have in some cases been traced to small variations in the sodium chloride and sulphate content of the fuel used. With refractory brick a kind of hard porcelain glaze appears to be formed, which on cooling is liable to lateral cracking or spalling, and the formation of the glaze has been traced to volatilized chlorides and sulphates. The use of a coal the inorganic residue of which contains, say, 18 per cent of sodium sulphate and 2 per cent of sodium chloride may add 10 or 15 per cent to the life of the brick lining as compared with a content of 36 per cent of sulphate and 4 per cent of chloride. The method of firing, quantity of excess air and fire mouth design are not without importance. The best results have been obtained by careful limitation of the salt content of the fuel and by using furnace linings lower in silica and higher in alumina.

PROGRESS IN OTHER TECHNICAL PROCESSES

An interesting possible development in connection with the use of dehydrated liquid rubber latex in accordance with the process mentioned in these notes of February is the possibility of mixing this special product with viscose solution, by which it is hoped to render artificial silk less hygroscopic and more resistant. The idea is similar to the use of liquid latex in paper manufacture, and kindred applications in connection with casein and like products are foreshadowed.

The concerns exploiting the colloid mill appear to be developing a more rational selling policy and progress is reported in certain directions such as the intimate mixing of water with tar or bitumen, partly for spreading on roads and also for watering them in dry and dusty weather. It is claimed that with a very small proportion of tar suspended in the water, evaporation is so slow that watering is not again required for several days, and the method employed is to take a relatively concentrated suspension and mix this with a large bulk of water before spraying.

A firm in Manchester is now carrying out extensive experiments on rubber roadways using slabs of rubber 2 in. thick and weighing about 600 lb. The slabs are reinforced with steel bars and their surface is corrugated. The slabs are set on a concrete foundation with tar joints.

GENERAL NEWS AND NOTES

The organization of the chemical exhibits at the British Empire Exhibition, Wembley Park, near London, to be held next summer, has already begun and it is understood that Mr. Woolcock, general manager of the Association of British Chemical Manufacturers, is likely to be one of the principal organizers. In spite of the heavy cost involved, this exhibition is expected to be an important factor in the industry and the most elaborate preparations are to be made for the accommodation and convenience of overseas visitors.

Chemical engineering education seems to be the latest vogue and the Ramsay Chair of Chemical Engineering at London University is now open. Liverpool is likely to follow and the newly formed Institution of Chemical Engineers, which has just held its first corporate meeting, is likely to play an important part in promoting and advising upon recognized courses in chemical engineering.

Among recent nominations to the Royal Society may be mentioned Prof. J. W. MacBain, professor of physical chemistry at Bristol, who was among those visiting the United States last year.

What Chemical Technology Has Done in the Shoe-Manufacturing Industry

Comparatively Recent Invasion Has Resulted in the Development of Many New Raw Materials of High Quality as Well as Profitable Byproducts—Improvements in Standard Processes Making for More Efficient Production

By Stanley P. Lovell
Chief Chemist, George E. Keith Co., Brockton, Mass.

About a decade ago chemistry invaded the shoe-manufacturing industry. The assault was of such meager proportions that it provoked only general mirth in the strongly intrenched shoe world. The making of footwear centers in and about Brockton, Mass., and although many other focal points of the trade exist, nowhere is the technique nor the high art of the Brockton district maintained. When the cult of scientific management swept American industries, it made no impress on the shoe business. That was already organized and specialized to an extent not found in any other fabricating art. Two hundred and thirty-six separate operations converge to make the finished shoe. Thirty-two separate crafts supply the shoe artisan with his materials. The method of shoemaking is furthermore so tangible, so apparent to eye and hand, so obvious in its gradations, that the mere thought of chemistry having a place in its craft or contributing anything of value to its product was somehow a capital joke.

If you will consider the primitive sandal or slipper, you will recognize it as an assemblage of three elements —the sole, the cap extending over the toes and receiving the forward impetus (now called the "box toe") and the support around the side wall of the heel receiving the backward impetus (now called the "counter").

The First Chemical Substitute

It was with the last two articles—the box toe and the counter—that the original chemical approach to the shoe industry concerned itself. Both were made from sole leather by separate companies that specialized in these parts and had brought them to a high degree of fabrication. Although sole leather had been the material used for these stiffening parts of footwear, it was apparent that it possessed inherent defects. When exported it would not stand the heat and humidity of the hold of a ship; it was easily attacked by the ordinary mold and maggot growths; and it was softened by but not soluble in water, thus losing when wet the delicate lines of the shoe last.

The method used to demonstrate these weaknesses of sole leather to shoemakers has possibly more so-called "human interest" than chemical interest, but it is nevertheless presented for what it is worth. A negro coal-heaver in the yard was asked to wear a pair of white socks for a week. These socks had been boiled in castile soap, rinsed repeatedly in distilled water, then extracted in alcohol and ether. After a week's wear, the socks were finely comminuted and extracted in a Soxhlet apparatus for water solubles, which were found to be as follows: Urea, sodium chloride, formic and butyric acids (trace).

Then into a concentrated solution of these substances was immersed a No. 1 grade sole-leather box toe, every substitute material on the market and a new product which proved to be the initial answer of chemistry to this problem. In 60 hours the materials were all destroyed except the chemical product, which was a mixture of cotton-wool fiber and nitrocellulose of the following composition by weight: Pyroxylin (nitrogen content 11.1 per cent), 81 per cent, and cotton-wool fiber, 19 per cent. From this indication of adaptability the use of nitrocellulose in one form or another has grown to the sizable amount of 2 tons a week.

A Unique Solution of a Chemical Problem

It was soon found that the product must conform itself to the established time of shoe operations. In order to change the pyroxylin to a plastic condition it had to be treated with a solvent and the time required to soften the box toe or counter blank when made with any of the familiar solvents was found to be too great. How to make a nitrocellulose blank relatively instantly soluble throughout was a desperately serious problem and promised to bring to ruin all our fine hopes of success. This problem we met by a unique treatment. Always previously it has been the endeavor of persons skilled in the use of pyroxylin to condition their product so that precipitation of the film (so-called "blushing") did not occur. To this end the name of John H. Stevens will always be famous. For this purpose some makers have even frozen out the entire moisture content of the air in their factories in order to insure against precipitation from atmospheric moisture.

Reversing this line of thought, we first impregnated

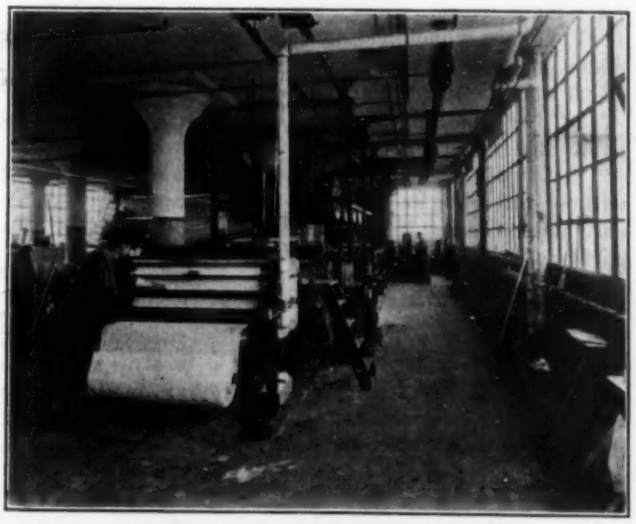


FIG. 1—MACHINES FOR COLLOID TREATMENT OF FABRIC AND PRECIPITATING BATH

our fabric skeleton or vehicle with pyroxylin in a water-miscible solvent, then immediately passed it into a precipitating bath. The precipitation, which at first is a mere surface condition, gradually penetrates throughout the sheeted material. Under a magnification of 300 diameters it shows itself to be composed of precipitated colloidal aggregates of the average diameter of 7μ. This gives a material of very high capillarity, there being countless ducts or capillary avenues opened from the former film surface to the center of the goods. This allows an immediate entry and instantaneous dispersion of the solvent into which the blank is dipped. In turn a flaccid, limp condition is produced, which with no appreciable loss of time allows the piece to be lasted and will faithfully reproduce every contour of the wooden last.

Thus we met our first obstacle of instant solubility by simply precipitating our nitrocellulose so finely that it was open to solvent action from every side of its vastly increased surface.

FIG. 2—ONE CORNER OF A BATTERY OF DIGESTORS
A web treated with precipitated colloid is to be seen winding up in the background.

Lowering Production Costs

The chemist and chemical engineer has at his elbow daily, hourly, the problem of putting production costs on an economical, competitive basis. Viewed with an unprejudiced eye, all leather is a byproduct of the production of foodstuff. It is for the meat, not the skin, that a Calabrian goat, an Indian cow, an American or pampas steer is grown. Therefore the skin, which must be removed to make the meat marketable, will either be allowed to decompose or will be preserved by such chemical agents as tannic acid, chromic acid, formaldehyde or alum and salt. Thus it follows that the skin or hide in the form of leather can be sold and would be sold at only a nominal profit over the cost of preserving or tanning should a synthetic chemical product be developed that would threaten to replace leather in industry.

Costs must be reduced to a wide margin under the production of leather. Seen from this angle, it early became important that the solvents used in the production of our precipitated sheet for box toes and counters should be recovered for re-use. Recovery was made relatively easy by the fact that these solvents, passing directly to a miscible precipitant, were never allowed to leave the vapor phase. By keeping them always as liquids even at extreme dilutions of 5 per cent, two ends were met:

(1) Their economical and continuous distillation was made possible without scrubbing towers, refrigeration or all the paraphernalia of the gas-to-liquid change.

(2) The fire and explosion hazard was reduced to a point where factory-scale production was practicable.

This twofold recovery advantage was not achieved without bitter experience with alcohol vapor—an experience which ended in an explosion of almost fatal proportions.

Camphor a Byproduct

It developed that pyroxylin plastics (such as celluloid, etc.) of good quality were preferable to straight nitrocellulose. The problem of a uniform raw material was solved by the easy scheme of "averaging out"—that is, the plastics were used in such large amounts that the variation in nitrogen content or in camphor content were averaged to a constant factor.

If you will retrace the steps taken to that stage where the colloid is precipitated in and on its fibrous base, you will see that if the solvent used is, for example, acetone and the precipitant is water, a relatively high acetone layer will surround the sheet as it passes through the bath. Into this stratum the camphor diffuses with a constantly increasing tendency to precipitate as it reaches greater dilutions of acetone. Eventually it becomes suspended like the casein suspension in milk, although scarcely colloidal. As the total volume of weak liquor passes into the base section of our continuous still the camphor passes up through the column to a point of maximum concentration. Fortunately this does not occur at the higher acetone or alcohol concentrations where the column might become obstructed and serious consequences result, but at the narrow range of 65 to 69 per cent acetone or alcohol. From these decks it is extruded at high velocity into a water jet of equal force, the impact throwing out the camphor as flowers of camphor. For ordinary use it is a commercial product at this stage, but for pharmaceutical uses it must be sublimed. Many tons of this grade of camphor have been absorbed by the American market. It is a highly important byproduct of our business.

One phase of this work has baffled the writer for many years. In the precipitating bath the urea or other antacid stabilizer must of necessity be completely removed by washing. Samples of the colloid-treated fabric show no trace of urea and the theoretical urea content is nicely balanced by the ammonia-carbon dioxide gases produced under the conditions of distillation. Nevertheless, samples of the product manufactured in 1915 and subsequently show no signs of decomposition, nor has the development of free acid in the nitrocellulose so precipitated ever been observed. Perhaps it is possible that the fact that urea has been there is sufficient to maintain stability almost indefinitely.

All of the camphor is not removed, between 5.1 and 9.3 per cent remaining in the sheet material entrained in the colloid. This has a most unexpected and desirable result. Being a remarkable insecticide, it prevents bacterial growth with mold and maggot formations not only in the box toe and counter but in the whole shoe as well. This is of first moment in the export of American shoes to sub-tropical countries and to the Orient.

The solvents used to colloidallize the finely precipitated celluloid just before its incorporation by the assembler in the shoe were various ethyl esters. These

solvents developed a most serious fault. The footwear would leave the factory in excellent condition, but upon being worn would develop a very disagreeable odor—not the pleasant fruity smell of the ester, but an offensive odor highly discreditable to the wearer. We found that when warmed repeatedly to 30 or 35 deg. C. the residual deposit of the solvent gave off the same odor. Nothing will more quickly stop the sale of footwear than this trouble. Furthermore, the factory operatives were finding the solvent unpleasant to work with and in the confined, close application which shoemaking compels, it would soon have proved a serious health hazard. Worden truly observes that the pyroxylin arts expand only as solvent knowledge grows.

It was imperative, then, to find a solvent of nitrocellulose that would have no appreciable odor under working conditions nor a residual odor in the shoe. After a prolonged research we found our answer in diacetone alcohol. This chemical, with a boiling point of 163 deg. C. and a specific gravity of 0.924, is miscible in all proportions with ethyl and methyl alcohol, acetone, benzol, water or any of the common esters. It is expressed chemically as 4 hydroxy-2 keto-4 methyl pentan.

FIG. 3—CONTROL AND RESEARCH LABORATORY IN A SHOE FACTORY

It leaves no residual odor and its rate of evaporization is so slow that it cannot be detected by smell in the workrooms. By diluting it, a degree of softening or solution may be maintained in the box toe for any desired length of time, thus allowing the product to conform to any established usage or schedule in shoemaking.

No investigator seems to have observed that it is the only solvent of cellulose esters that has at once a high boiling point, is miscible in all proportions with water and leaves no residual odor. Most books of reference on applied chemistry such as Watts, Thorpe, Olsen and the Condensed Chemical Dictionary do not cite it. To those industries where the odors invariably associated with cellulose esters have been handicapping factors diacetone alcohol should prove of great value.

We erected and operate a large plant for the production of diacetone alcohol. Its manufacture by the polymerization of c.p. acetone is expressed by the following equation:

$$2CH_3\cdot CO\cdot CH_3 (+ \text{Catalyst}) \rightarrow CH_3CO\cdot CH_2\cdot C(CH_3)_2OH$$

Since the balance between the c.p. acetone and diacetone alcohol produced in the presence of the catalyst is in direct proportion to the temperature and greater at lower temperatures, the utilization of sulphur dioxide or ammonia refrigeration is strongly indicated.

The catalysis building shown in Fig. 4 has a daily capacity of 600 gal. of diacetone alcohol of specific gravity 0.910. Sufficient water is used for condensing to warrant two artesian wells which deliver an unlimited supply of water at 10 deg. C.

The box toe and counter produced are waterproof, sweatproof and safe against the ordinary forces of destruction. They have the peculiar property of resisting distortion. This true elasticity retains the lines of footwear in a way never before possible.

Chemical technology having met with tolerable success in the make-up of a shoe, the same approach was tried on the innumerable items applied to the outside of a shoe. These comprised dressings, polishes, waxes, inks, washes, etc., to a degree of complexity fairly confusing. We now manufacture over one hundred and thirty separate materials of this sort. All were subjected to analysis, made interesting because the method of analysis had first to be worked out. Many weird combinations were unmasked, but on the other hand many combinations were shown to possess a high degree of observation and skill.

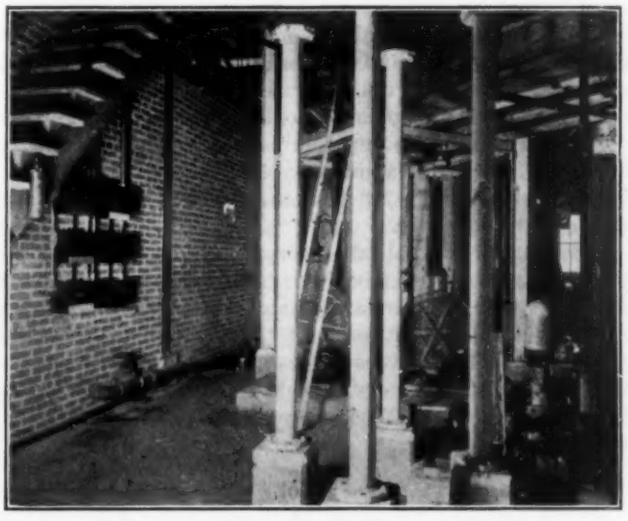


FIG. 4—CATALYSIS BUILDING WHERE 600 GAL. OF DIACETONE ALCOHOL IS PRODUCED DAILY

I strongly advise any industrial chemist who scoffs at rule-of-thumb products (and I am one) to make a water paste for shoe use. I have a record of over three hundred experiments before satisfactory results were obtained on this product. That with so little understanding of the nature of their materials the non-technical men can accomplish so much will always be a source of wonderment to me.

I think it is conservative to say that chemical engineering has a place even in such an apparently barren field as shoemaking. It has led to one of the large uses for pyroxylin, it has produced diacetone alcohol on a basis never before attempted and it has made camphor a small byproduct of shoes. But more than that, it has allowed the production of a better shoe than before chemical technology entered shoemaking, and that is the test of its worth.

The Incidence of Research On the Baking Industry

Pioneering Work in the Application of Science to a Successful Commercial Enterprise

BY ELLWOOD HENDRICK
Consulting Editor, *Chem. & Met.*

THE penetration of the industries by science is sometimes along curious roads, and it is well to bear in mind that these are often in their beginnings far from academic. The active research that has developed within the baking industry during the past few years induced us to visit the Ward Baking Co.'s establishment in New York, to note the incidence of research upon this ancient domestic art, to inquire into the way in which it was begun, what problems are pressing and what fields are tempting them toward further study. We selected the Ward company because we knew them to be progressive and also that the president of the corporation had been an active supporter of research for a number of years. It was done with no unfavorable reflection on competitive baking establishments.

We found a large bakery operated under laboratory cleanliness, with standard machinery which we shall not attempt to describe, because such details are available elsewhere. Two laboratories are maintained, one for control that is predominantly chemical, and a separate research laboratory in which biochemistry leads. About twenty-five chemists and biologists are employed constantly.

The central control laboratory functions for the company's various bread and cake bakeries, of which there are seventeen of the former and nine of the latter in different localities throughout the country. This calls for over 20,000 analyses or tests per year. The capacity of the bread bakery attached to the main office in the Bronx in New York City is over a quarter of a million loaves a day.

BEGINNING OF BAKING RESEARCH

The beginning of research, which has continued to be coincident with the progress of the company, is an instructive tale. The president of the concern was a hard-working neighborhood baker in Allegheny, Pa., and he was so diligent in extending his trade that he became pressed for funds. His bank of deposit would not increase his credit, and a second bank visited felt in the same way. Then, unknown, he called at the Mellon bank in the hope of securing an accommodation of $10,000. He saw the present Secretary of the Treasury, Andrew W. Mellon, and told him his story. Mr. Mellon surprised him with a more complete report of his standing and business than he expected him to have, and said he didn't see how $10,000 would solve his problem. The banker figured the situation over, and it did not look promising. What the baker really needed was about $25,000. So Mr. Mellon declared that he couldn't see his way clear to lending him $10,000—although if he wanted $25,000 he could have it. That was a jolt up rather than a shake down, and it will be easily understood that from that time forth George S. Ward was a frequent visitor at the Mellon bank.

Then came the organization of the Mellon Institute of Industrial Research at Pittsburgh, and by this time Mr. Ward had prospered. He had bakeries in various cities—in Pittsburgh, Chicago, New York, Cambridge, Mass., and elsewhere. Mr. Mellon was full of enthusiasm for the Research Institute, and the prosperous baker had enthusiasm for Mr. Mellon's opinions as well as a sound belief that whatever happened must be due to a cause and if the cause lay hidden it was his business to look for it. He started with an open mind toward and a prepossession in favor of scientific research. He already had laboratory control of his various bakeries. This fact is the text for a longer sermon than we have the space to preach. Without at least one successful man in an industry who has an abiding faith in the value of scientific research there can be no real beginning. The baking industry was one of the last of the major industries to come under scientific control, and yet its present rate of progress is remarkable.

THE FIRST PROBLEM

In later years laboratory control has developed important refinements, but even then the flours were tested for gluten, moisture, ash, etc., and several bakings were made to obtain uniform results. Flours differ according to their origins and according to the year in which the wheat is grown. Some require long mixing, others short, some long and others short fermenting, and some long and others quick baking and the like. Yeast also requires constant testing. But with the same flour, the same yeast and the same apparatus and methods, the bread from one city differed from that baked in another, and the reason for this was a problem in research.

There had been a research fellowship in bread baking established at the University of Kansas by the National Bakers Association before Dr. Duncan left there for Pittsburgh, but this had been allowed to lapse. The problem before the baker as patron of research was the contumaceousness of that bread which should have been the same, whether made in Cambridge, Mass., or Pittsburgh, Pa.—but wasn't. He applied for one of the early fellowships of the then new Mellon Institute and Dr. Duncan was ready for it with Drs. Kohman and Hoffman, who have not quit the study of baking from that day to this. Investigation began with comparison of waters used, and their differences showed their effects mainly on the yeast, which responded quickly to differences of salts in solution.

For maximum health and growth yeast needed more nitrogen in simple fixation, more calcium and other mineral salts than are available for it in ordinary dough. It was also discovered that when these usually delinquent salts are added to the dough, the yeast grows so lustily and acts so vigorously that only one-half the amount of it is needed to produce the same or even better bread. Experience shows that by using the mineral salts in the dough a saving is made of one-half the amount of yeast, one-sixth the amount of sugar and about 2 per cent of the flour. The yeast food mixture was patented and named "Arkady" after the initials of Dr. Robert K. Duncan, the director of the Mellon Institute, and it has now come into general use in the baking industry. The owners of the patent make it in carload lots in their New York bakery, and they have additional factories in England and Canada.

THE FIGHT OVER YEAST FOOD

But improvements have hard sledding when they are introduced. Trouble arose in one commonwealth where the gifted statesmen of the Legislature took a hand and assumed a firm stand against any effort to "cheapen"

the staff of life. They knew from their blessed mothers and the faithful wives of their manly bosoms that only certain ingredients should be used in making bread, and they passed a law that said so. Otherwise each loaf was to be labeled as containing in the original mix whatever was not indicated in the statute as proper. Calcium sulphate, for instance, was an important factor in this yeast food, but inasmuch as it was not recorded in the law, it had to be mentioned in the label, along with potassium bromate, ammonium chloride, etc. Despite the fact that calcium salts are sorely needed in human nutrition and that human diet of today is often inadequate in this respect, it shocked the lawmakers to think that there should be such a thing as lime in bread. Soon the fight was on, although bread so baked and labeled continued to sell. The legislative plan was to educate the public down—to its own level—rather than to educate it up; but this time it did not work. Then a law was proposed forbidding altogether the use of yeast food in baking, but this was defeated, and finally the fight was won. It took time and vigorous effort and money for lawyers. Today yeast food is in general use, and even manufacturers of yeast whose sales are decreased by it recommend it because it reduces complaints about this product to a minimum.

An old and serious trouble in baking is the occasional presence of "rope," or stringiness, in bread. It is due to an organism present in all flours, but more abundant—and therefore worse—in some than in others. We understand that the defect has been practically overcome by the proper control of the p_H values in the dough.

In the course of time the more progressive bakers recognized the value of research, organized the American Institute of Baking, first at Minneapolis and now located at Chicago, under the competent supervision of Dr. H. E. Barnard. But private research for the Ward company continues also at the Mellon Institute in Pittsburgh, under Dr. Kohman, and in the laboratory of the New York bakery under Dr. Hoffman.

Food Value and the Vitamines

Bread making has only so lately entered into the domain of science from rule-of-thumb control that it fairly bristles with questions. For instance, bread is a food, but how much of a food is it? This was the beginning of a long work at research by the Ward company, from which, in the end, positive results of an interesting character were achieved. It was found that a good bread is adequate in carbohydrates, but deficient in protein, mineral salts, especially lime, and in all three vitamines. Quantitative determinations were made. Whole wheat bread, it was observed, adds vitamine B from the bran and wheat germ contained in it, and it is adequate in carbohydrates, but research proved it to be lacking in other respects. Experiment demonstrates it to be an incomplete food, although better than an ordinary white bread.

Now the major purpose of this research was to make a bread at once good, and at the same time having a maximum nutritive value. It is easy enough to throw a number of nutritive ingredients into a dough that will serve as a "complete food," but when it is baked it will be more of a dog biscuit than a bread.

The problem was to provide, as carrier of these exceptional nutritive values, a fine, tasty and attractive loaf of white bread. This involved thousands of feeding tests as part of the work. Another step was the extraction of the germ of the wheat, which is ordinarily discarded in white flour, and this involved a new process and finally a separate plant equipped at large cost at Warren, Ohio. The final loaf is made far richer in milk than ordinary bread; it contains the germ extract that is as rich in vitamine B as the best brewer's yeast, and it contains abundant mineral salts, which are greatly needed for the maintenance of health and for healthy growths, even to the extent of the slight but requisite amount of manganese.

Feeding Experiments

The final loaf is white, looks and tastes rather like home-made bread, and it is already in active demand. It is not only rich in vitamine B but carries enough of the A type to support life, growth and reproduction. Ordinarily the vitamine A is provided by spreading bread with butter, but this bread also contains a supply from the extra whole milk. Tests made with white rats and white mice show remarkable results with no other food than this new, enriched bread and water. With any other type, including the best whole wheat bread, as the sole diet with water, they fail to grow, fail to reproduce and in time starve for lack of one or another kind of nutrition. With this new bread as sole diet, growth is vigorous and healthy, and already a fifth generation of white mice that, beginning with the first, have never had any other food, is thriving and growing normally.

Observations are now being made and recorded of children from pre-school age up to adolescence who include this bread in their diet, compared with those who do not. While results are not ready for publication, they appear to confirm the animal feeding experiments already made, and promise to add materially to our knowledge of nutrition. One point we are allowed to mention is that less meat seems to be desired along with this special bread than if ordinary bread is eaten.

Large Quantities of Copper Imported

In *Commerce Monthly* it is reported that large amounts of copper have been imported into the United States in the form of ore, matte or blister copper, the smelting and refining of which are done in this country. Imports from Chile have shown a remarkable gain from pre-war years, when they were very much less than those from Mexico, Canada, Peru or Spain. During the past few years they have constituted more than one-third of the total imports.

Shipments from Peru and Cuba have also increased. Peru sends chiefly blister copper, while most of the Cuban shipments are in the form of ore and concentrates. From Japan and Australia, however, a very much smaller quantity has been imported recently because of the decline in production in those countries. Mexican and Spanish imports have also declined. From the average rate for the first part of the year it appears that Canadian shipments in 1922 were as large as before the war. Most of the copper was in the blister form.

Of the total imports in the first part of 1922, 53 per cent was blister, 21 per cent refined, 14 per cent ore, 6 per cent old copper and clippings and 4 per cent concentrates. Imports of matte constituted the remaining 2 per cent. Composition metal in which copper forms the chief value amounted to only 0.2 of 1 per cent of the total.

A Modern Tar Distillation Plant

A Description of the Plant of the American Tar Products Co., in Chicago, Illinois, an Example of Permanent and Conservative Design Which Warrants Study

BY WILBERT J. HUFF
Chemical Engineer, The Koppers Co.

THE Chicago plant of the American Tar Products Co., which commenced operation for the first time only a few months ago, undoubtedly ranks as one of the leading, if not the very first, merchant tar plants in the United States. A brief description of its salient features will be of interest to those who are engaged in this and related industries.

The plant was built by the Koppers Co., which has installed several other tar distillation plants for the American Tar Products Co. It is situated on a 35-acre tract at South 52nd Ave. and West 39th St., directly south of the once famous Hawthorne Race Course, and immediately north of the Chicago & Illinois Western R.R. and the Chicago Drainage Canal. The plant of the Chicago By-Product Coke Co., at present the chief source of the tar distilled, is east about one mile, in plain view across the prairie. Switching facilities are provided both to the C. & I. W. (a belt line) at the south and to the Illinois Central (a trunk line) about 1½ miles to the north. Should the proposed development of the drainage canal occur, service to any plant on the Chicago waterfront will be available by barge.

Only about 20 of the 35 acres are at present occupied; and the arrangement of the equipment upon these 20 acres is such that the inevitable expansion of the plant may proceed along orderly lines until the entire 35 acres can be occupied, without necessitating the misplacement of any part.

The general plan of the present plant is shown in the accompanying diagram (Fig. 1). The observer, upon first entering the plant, will be impressed not only with the systematic plan and convenient arrangement, but especially with the quality and permanency of the equipment. The construction throughout, save of the barrel shed, is of brick and steel, with concrete foundations and cement floors and platforms; and all shipping and receiving wharves and platforms are elevated to car level. The exposed brick surfaces are buff and yellow. All elevated platforms, walkways, ladders and stairs have been designed and erected in accordance with the best practice as regards safety.

Before considering in detail the component parts of the plant it may be well to recall the general technology of tar distillation. This was discussed by the writer in this journal recently,[1] accordingly only a brief mention is warranted here. Coal tar, the primary condensation product from the carbonization of coal, is a complex mixture chiefly of aromatic hydrocarbons and tar acids, with small amounts of tar bases, organic sulphur compounds, variable amounts of so-called "free carbon" and other materials. Some water is also present.

As produced these are so thoroughly incorporated that it is necessary to resort to a process of fractional distillation in order to effect separation. This process the writer has shown diagrammatically in the accom-

[1] *Chem. & Met.*, vol. 26, No. 3, Jan. 18, 1922.

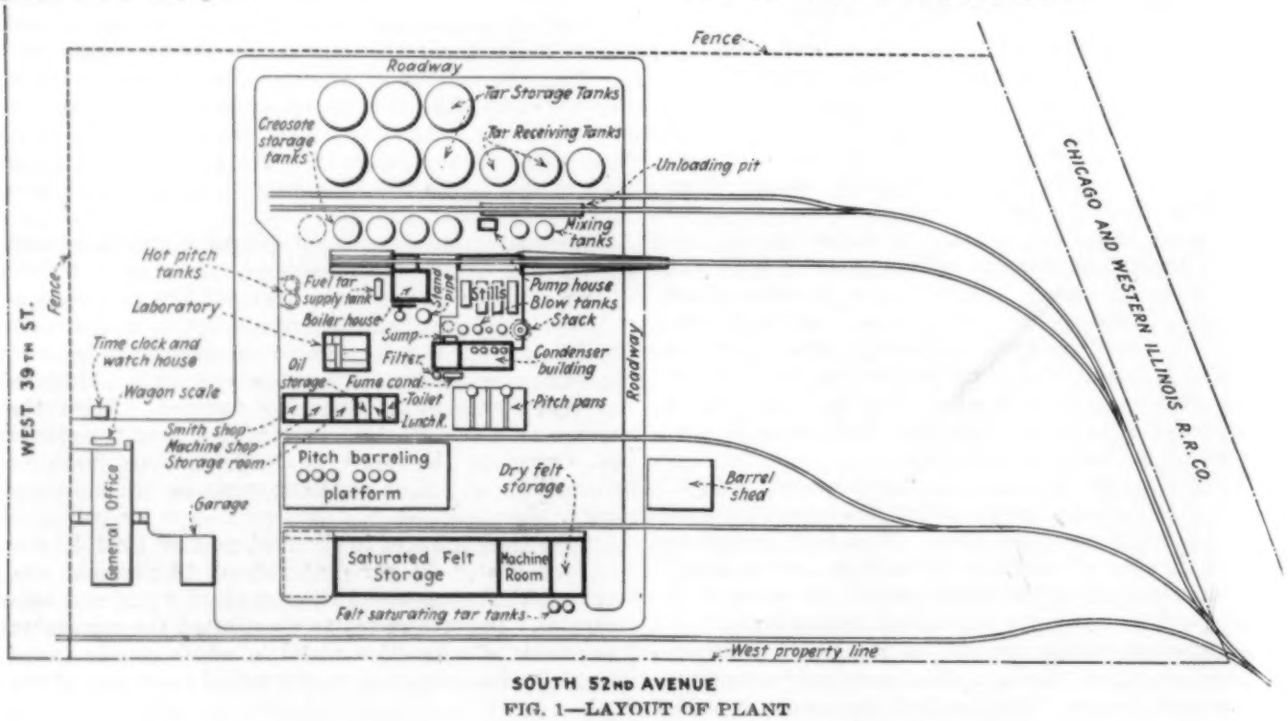


FIG. 1—LAYOUT OF PLANT

panying sketch (Fig. 2). The residue remaining in the still, generally amounting to over 50 per cent of the raw tar and sometimes as much as 70 per cent, is the familiar bituminous aggregate known as pitch. Depending upon the amount of oil removed, it may be soft or hard; and if only a little oil is removed, it may be called merely a refined tar.

Handling of Tar

Procedures are, of course, modified to meet varying local conditions. Thus, if the water content of the coal tar available is low, it is not always necessary to subject it to a preliminary dehydrating process. Instead the raw tar is often charged directly into the still and the water removed by cautious firing. Not all of the fractions need necessarily be taken. The number is determined by the kind of residue which must be produced, and as the character of this is varied to meet the wishes of the purchaser, so too the character of the distillation must be varied. Nor are all the products shown necessarily manufactured. Thus, while at this

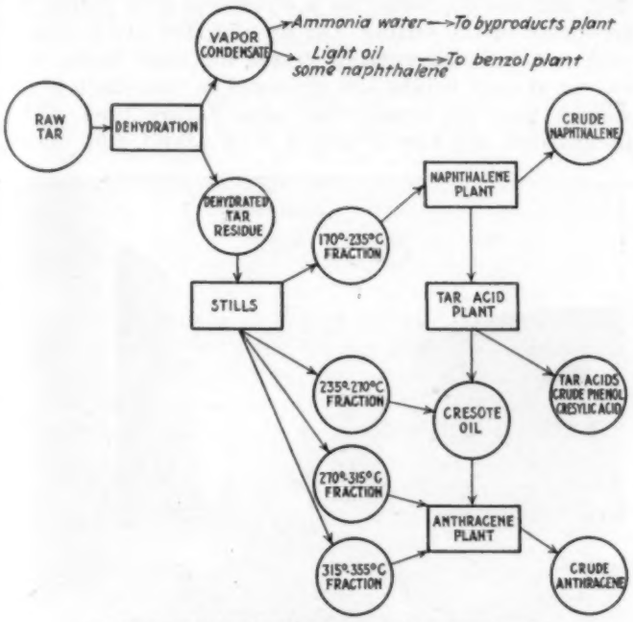
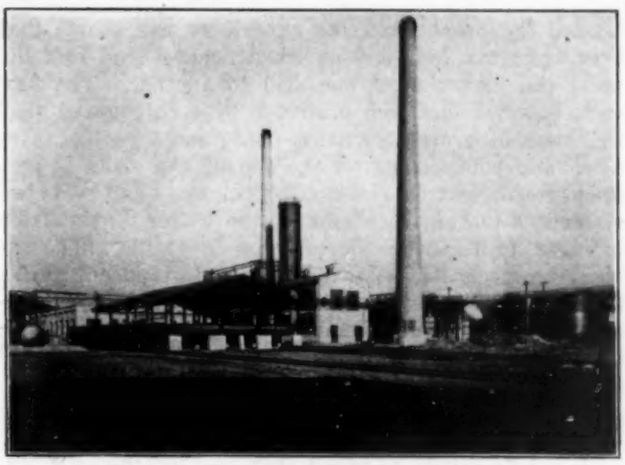


FIG. 2—FLOWSHEET FOR TAR REFINING

plant provision has been made for the future recovery of anthracene, naphthalene, tar acids and other materials from the distillate oils, and detailed drawings and specifications for the buildings and equipment have been prepared, construction has not yet begun, and the distillate oils are not treated further here.

The tar is brought to the plant in a tank car. Here it is placed over one of three concrete sections of the unloading pit, where it is emptied by gravity through the bottom cock. Each section holds 10,000 gal., so three cars can be unloaded simultaneously without calling upon the tar pumps. These are two in number, steam driven, all iron-fitted duplex pumps, having a capacity of 20,000 gal. per hour. They are situated in a pump house adjacent to the tar unloading pits and are mounted on a floor depressed about 6 ft. below the yard level. Connections are provided so that the pumps may be applied as needed in the transportation of tar from the unloading pit to the tar receiving tanks or to the tar storage tanks; and for pumping tar to the stills, to mixing tanks and to cars. A large amount of water-gas tar is produced at the plant of the Chicago By-Product



GENERAL VIEW OF PLANT—PITCH PANS IN FOREGROUND

Coke Co. and much of this is re-handled here. The car-loading appliances (swing pipes with swivel joints), three in number, are located just east of the unloading pit and so placed that three cars can be loaded without shifting.

Distilling Tar

Tar for distilling is pumped from the appropriate tar tank to any one of the stills which are grouped in battery. They are mounted in brick settings with underground concrete and brick breeching leading to a 130-ft. brick stack and are equipped with grates of the rocking type for coal firing by hand and burners for firing with liquid fuel when such firing is economical. Coal is brought up to the stills in the railway cars and is discharged from an elevated track, parallel to and in front of the firing doors. This same track also serves the boiler house, adjacent to and north of the stills. The concrete floor from the stills and boiler house extends under this track. A concrete wall parallel and east of the track retains the discharged coal upon this floor.

From the stills may be seen two other details which further illustrate the attention and care expended in the construction and management of the plant—a concrete subway affording convenient passage under the fuel track, and the practice of painting different pipe lines in distinctive colors.

The battery of stills is not roofed over. This dim-

TANK CAR LOADING AND UNLOADING
Stills, pumphouse and standpipe in background.

inishes the fire hazard, for experience has shown that fires are much less serious when no overhead roof deflects the flames from one still to another. The firemen, however, are well protected by a corrugated steel roof extending over the firing floor; and access to manholes and connections on the top of the stills is rendered convenient by railed steel walkways and two steel stairways, one on each side of the battery. Provision is made to facilitate cleaning of the stills. The tar used, however, has so far shown little tendency to deposit objectionable material, and this cleaning consequently has been very simple. A special sampling winch is mounted above each still, for the stills are designed and calked to withstand a vacuum of 26 in. of mercury, and special provision must be made to permit sampling without breaking this vacuum. Each still is equipped with safety valves so piped that such of the still contents as may blow over is discharged into a sump about 60 ft. distant from the nearest fire door. Provision is also made that the contents of any still may be diverted from the usual receiving tank to this sump.

Condenser House

Between the battery of stills and the condenser house are pitch blow-tanks, measuring and mixing tanks. All blow, storage and receiving tanks, wherever situated, are equipped to permit easy access. Every large tank is provided with hand rails and is accessible by wide, easily scaled stairs and walkways. Above the pitch blow-tanks extend four insulated condenser lines from the still domes to the condenser house. Here they enter four elevated coil condensers of equal size. At the discharge of every condenser is a receiving tank, divided into two compartments, each of which may be completely cut off from the other. The condensate may be directed into either of the two receiving compartments at will. This permits easy fractionation under vacuum, as one compartment may be cut out and drained under atmospheric pressure while the vacuum is carried on the other.

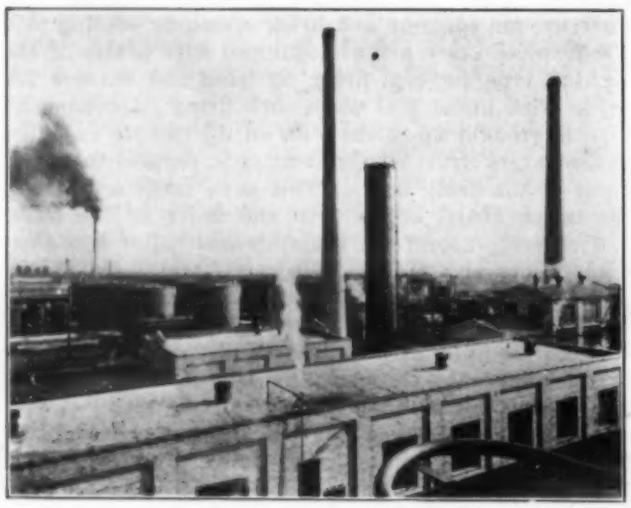
Each compartment is equipped with an indicating device to mark the oil level and a manhole to permit easy cleaning, and is piped so that it may drain by gravity into any one of the run-down tanks, which are of various capacities to suit the size of fractions being made. Provision is made for easy access to all parts. Two independent sets of pyrometers, operating and master, are mounted so that their dials may be read from the platform that commands the four receiving tanks. This permits the operator to follow simultaneously the pitch and vapor temperatures, and the volume of oils condensed.

The condenser house also provides protection for two steam-driven air compressors; two steam-turbine exhausters, so piped that any uncondensed vapors from the receivers carried by these exhausters are expelled into a secondary condenser; two steam-driven, all iron-fitted, duplex oil transfer pumps, and one steam-driven duplex emergency pump. Provision is made so that the final stages of the distillation may be completed under vacuum, or by the aid of steam or air agitation, if desired.

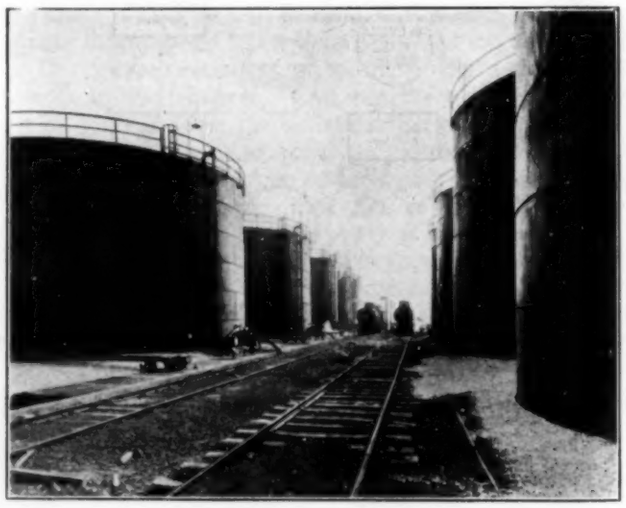
The Power Equipment

North of, and adjacent to, the battery of stills is located the boiler house, containing two 250-hp. Stirling boilers, of which one is in daily use, while the other is held in reserve. These are both arranged in one setting, and are supported on a structural steel frame independent of the setting. At present they are equipped with non-dumping rocking grates for hand firing, but are set at such height and arranged so that chain grate stokers may be installed at some future time. The foundations are also arranged with ashpit and tunnel to facilitate such installation. In times of coal shortage, these boilers may be fired by liquid fuel pumped from a tank north of the boiler house through an overhead return system running parallel to the fuel track and extending to the southern end of the battery of stills. Provision for steam heating the liquid fuel to diminish its viscosity is made. The liquid fuel consumed is metered. Draft is provided by means of a 150-ft. stack. The boilers are fed by two steam-driven duplex feed pumps and are provided with an open type feed water heater.

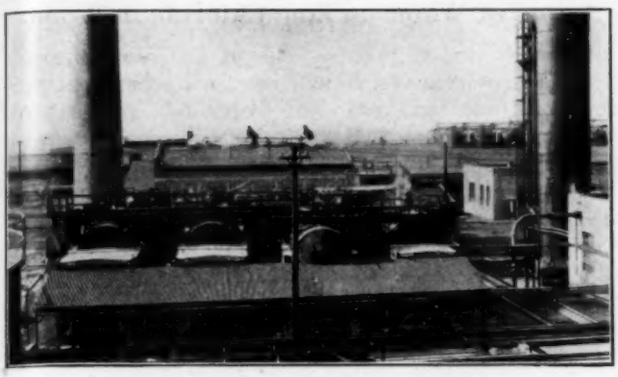
An extensive equipment for protection against fire is provided. Capacity and auxiliary water pressure is obtained by means of a standpipe about 90 ft. high and 15 ft. in diameter located just south of the boiler house stack. This is divided into two compartments by means of a partition 60 ft. above the ground, and the top compartment is held full in reserve for fire, while the lower compartment serves as a general service water supply. In the boiler house is located the fire pump—a standard



SHOPS—TANK FIELD IN BACKGROUND



TAR AND CREOSOTE STORAGE TANKS



STILLS AND CONDENSER HOUSE

duplex fire pump having a capacity of four standard fire streams. Six twin fire hydrants are located at advantageous points about the plant, and five 250-ft. lengths of hose are distributed in convenient boxes. In addition, hand foamite and carbon tetrachloride extinguishers are located in the buildings.

Oil and Pitch Handling

From the oil run-down tanks, the distillate oil may be pumped to one of three oil barreling tanks above the pitch barreling platform, or to any one of the creosote storage tanks situated between the boiler house and tar storage tanks, or to either of two mixing tanks on line with and just south of the creosote storage tanks, or to the pitch blow and mixing tanks or the mixing storage tank.

Hot liquid pitch is transferred by compressed air from the pitch blow tanks to the barreling tanks or chilling tanks. Proper piping and other equipment have been installed to condense all vapors or fumes incident to handling hot pitch, thus recovering some oil otherwise lost and also avoiding trouble caused by the nuisance of tar, oil and pitch fumes.

When a hard pitch is produced, it may be blown to one of two tanks located above the pitch pans, west of the condenser house. These pans are of steel, four in number, supported on steel beams about 6 ft. above the yard level. Each pan is about 50 ft. long and about 20 ft. wide, and not quite 2 ft. deep. The hard pitch, when sufficiently cool, is discharged from the tank by means of a trough into either of the two pans immediately below it, where it is allowed to solidify. Pitch of this quality is sufficiently hard and brittle to permit it to be broken up and loaded in bulk. The pans are covered by a galvanized steel roofing, supported on steel beams; but the sides are not inclosed.

The soft grades of pitch may be blown to one of the pitch barreling tanks supported on steel framework above the pitch barreling platform. This platform is approximately 200 ft. long and 80 ft. wide, and consists of concrete walls a little over 4 ft. high, between which is filled well-tamped earth to within a foot of the platform level. Cinders and concrete are placed above the earth and the whole is topped with a smooth coat of cement and sand cut off into squares. In addition to the pitch barreling tanks, there are oil tanks for the drumming of distillate oils. All tanks are of the same size and are located above the north and central portion of the platform.

About the tanks and over the entire platform extends a galvanized steel roof supported on steel framework. The sides are, of course, not inclosed. Access to the tanks is provided by means of a ladder and a walkway placed above the roof. The southern portion of the platform serves as storage for steel drums, and it is to this portion of the platform that the empty barrels are delivered from the barrel storage shed. This is isolated well to the south of the present equipment, thereby minimizing its fire hazard. The floor consists of well-packed cinders and the roof and sides are of galvanized sheet steel, supported upon a wooden framework. The sides are inclosed from the roof to a height 12 ft. above the ground. The barrels are rolled to the platform by placing them upon the inclined elevated barrelway which extends from a point a few feet north of the barrel shed to the southern end of the barreling platform.

Felt Saturating

West of the barreling platform is located the felt-saturating building. This is of light structural steel construction with walls of Chicago yellow building brick and a roof of gypsum covered with pitch and gravel. The interior is well lighted by numerous windows along both sides. It is divided into a warehouse which occupies the northern and central two-thirds of the building, a machine room, and a dry felt storage room which divide the remaining space equally between them. The floor is of concrete. Roof and floor are extended to form a covered wharf the height of a car floor along the entire eastern side of the building. Dry felt is continuously saturated with especially prepared tar in such a manner that evenness of saturation is obtained and sticking of felt in the small tarred felt rolls as delivered to the roofer is eliminated. The hot saturator baths give off tar vapors which are somewhat objectionable, so the necessary ventilation is secured by means of two steel stacks about 2½ ft. in diameter extending about 25 ft. above the roof. Storage for the saturating tar is provided by two tanks just outside the west wall of the machinery room and the drip tanks from the saturators drain into an underground tank. This drain tank is emptied by air pressure into drums located on the machinery room floor.

East of the pitch barreling platform is located the shops and service building, containing machine and blacksmith shop, storeroom, oil room, service room and lunch room. The machine shop contains the necessary pipe-fitting machines, drill press, lathe, grinding ma-

LABORATORY, SERVICE BUILDING, PITCH-BARRELING SHED

chine, forge and anvil for local repair and equipment purposes. Power is supplied by a steam engine. The service room is provided with lockers and the usual complement of showers, wash stands, toilets, etc. Three solid brick walls within the building separate the lunch room, the service room, the oil room and store room, so that the first three are accessible only from the outside and are protected from each other in case of fire. In harmony with the others, this building is of Chicago yellow building brick.

LABORATORY AND OFFICE

East of the shops, in the north central portion of the plant, is the laboratory—a one-story building containing not only the regular plant laboratory but also a large research laboratory devoted to chemical problems common to the numerous plants of the company, together with an office for the chemical director of the company and his stenographer, a library, a locker and toilet room and store rooms. A sketch of the floor plan is shown (Fig. 3). The building is approximately

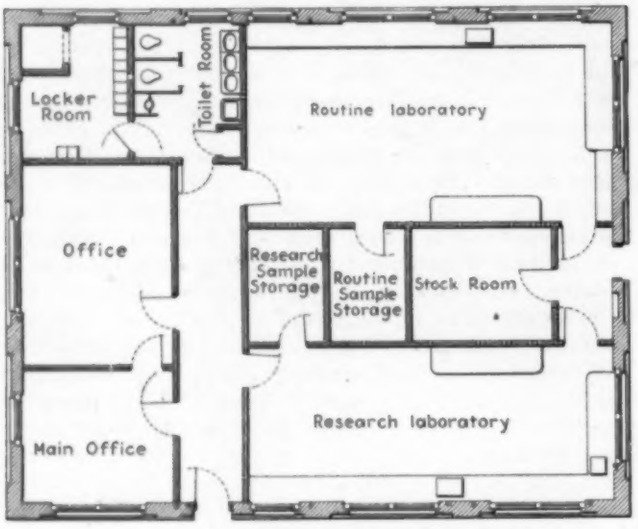


FIG. 3—LABORATORY

43x54 ft. with 10-ft. ceiling, and with a concrete floor at yard level. There is no basement. An emergency shower for extinguishing blazing clothing is provided in each laboratory.

In addition to the foregoing, there is a garage north of the felt saturating building. This serves the usual trucks and cars and the motor-driven distributors employed by the company for the hot application of road tar. An office building will be located at the northwest corner near the gate and wagon scales, but the erection of this has not yet been begun.

A plant such as that described above can supply a large number of tar, oil and pitch products—such as creosote oils, wood-preserving oils, high-tar acid oils, tar felt, dehydrated tar, refined tar, tar and oil mixtures such as the rather well-known 20 tar 80 oil mixture used in wood preserving, and such pitch products as pitch paints for the protection of iron and steel, for acid-proofing and alkali-proofing and waterproofing, roofing pitches and patching compounds, waterproofing pitches, paving pitches for hot or cold application, for concrete and for tar macadam, and as a filler for block and for brick pavements, core pitch, briquet pitch, and pitch for the preparation of pitch coke.

The Koppers Co. Laboratories,
Mellon Institute of Industrial Research,
Pittsburgh, Pa.

Action of Water on Zinc Chloride in Wood

Although zinc chloride is one of the most effective of wood preservatives, it will not give permanent protection. Under the action of water this preservative loses its strength in two ways. In time a considerable amount of the solution is leached out of the wood, and that remaining is not of sufficient strength to be effective. It has also been brought out in a study of preservatives at the Forest Products Laboratory at Madison, Wis., that water eventually causes a chemical decomposition of zinc chloride by the removal of excess amounts of chlorine.

Samples of ties analyzed after service had a zinc content equivalent to 0.4 lb. of zinc chloride, with scarcely enough chlorine present for 0.08 lb. of zinc chloride per cu.ft. Treated blocks leached for a month at the laboratory lost about 90 per cent of their chlorine content and only 70 per cent of their zinc.

The disappearance of the chlorine from zinc chloride explains decay which has been found in treated ties and timbers which still have high zinc content. Although the zinc is the toxic or poisonous part of zinc chloride, it is not effective against the fungi which cause decay unless it is combined with some acid radical which makes it soluble. In analyzing zinc-chloride-treated wood after service, it is necessary to determine both the chlorine and zinc content in order to calculate the amount of preservative solution present in the wood. Even then only a rough estimate can be formed, for some of the chlorine which would be obtained in the analysis is in the wood in the form of an insoluble basic chloride of unknown composition.

Paint and Varnish Production

During 1922 the production of white lead in oil amounted to 292,588,900 lb., as compared with 274,226,900 in 1921, an increase of 6.7 per cent. Zinc oxide in oil produced during the past year amounted to 9,944,400 lb., representing an increase of 62.1 per cent from the previous year. Figures reported for the production of paste paint show an increase of 29.4 per cent. The paste paints as a group increased considerably during 1922. The large increase is found, however, in ready mixed and semi-paste paints, varnishes, japans and lacquers—44.4 per cent in the case of the former and 54 5 per cent for the latter group.

Distillation of Hardwood in Canada

The majority of the destructive distillation plants in Canada have been absorbed by the Standard Chemical Iron & Lumber Co. of Canada, Ltd., now reorganized as the Standard Chemical Co., Ltd., Montreal. Central alcohol refineries have been established at Longford, Ont., and Montreal, Que., acetone plants at Longford and Sault Ste. Marie, Ont., acetic acid and formaldehyde plants in Montreal. Considerable quantities of charcoal are used by a subsidiary, the Standard Iron Co., Ltd., in making charcoal iron. Distributing companies have been formed to market charcoal in the principal cities as household fuel.

During the war the demand for acetone, methyl hydrate, formalin and other hardwood distillation products was very great and it is a significant fact that a single well-organized company handles practically all operations from the cutting of the wood to the manufacture and sale of the finished chemicals.

Eighth Annual Convention of T.A.P.P.I.

Many Paper Technologists Take Part in Program Covering the Most Vital Problems of the Industry—First Paper Industries Exposition a Success

THE Technical Association of the Pulp and Paper Industry held its annual spring meeting at New York during the week of April 9. The American Paper and Pulp Association and other affiliated organizations also held meetings at the same time in order that as many paper men as possible might attend the first Paper Industries Exposition, which was likewise held during the week.

At its annual election of officers the Technical Association made H. S. Taylor of Dayton, Ohio, president, with G. N. Collins of Philadelphia vice-president. These men succeed G. F. Williamson and F. C. Clark respectively. The only vacancy on the executive committee was filled by the election of B. T. McBain to this body. W. G. MacNaughton continues as secretary-treasurer of the association.

At the first session of T.A.P.P.I. reports of officers and of standing committees were read showing what progress had been made along the various lines of association activity during the war. The bibliography committee has begun the work of indexing all the literature available on paper and pulp. The executive committee has obtained the co-operation of several other societies, including the American Society of Mechanical Engineers, the Cost Association of the A.P.P.A., the National Lime Association, the National Safety Council and the Wire Manufacturers' Association.

Vocational Work Centers Much Interest

The vocational work of the association is being more actively supported in every way in Canada than in the United States. Greater contributions to the fund for preparation and publication and greater use of the texts are reported in that country than in this. The fourth volume on the preparation of stock for paper manufacture is nearly ready for the press. The final volume will probably be published about January, 1924.

Feel Decided Need of Standardization

Nearly every committee reporting on research emphasized the increasing demand for standardized specifications and methods throughout the industry. Investigational and operative data require adoption of standard units for measurement and test. Apparatus used for test purposes is especially in need of this standardization. Uniform tests are in demand more and more for unusual products.

Increase Production Efficiency by Cutting Waste

G. E. Williamson, chairman of the waste committee, presented three main subjects for discussion, white water losses, bark utilization, and broke loss prevention. Fiber loss in mill effluent prevents maintenance of maximum efficiency in use of materials. This can be cut by use of save-alls—simple inclined screens over which white water (fiber-bearing water) flows, rotary screens such as ordinary continuous rotary filters, or more complex arrangements of tanks and screens. Large sedimentation tanks give very good recovery of pulp. In discussing this subject W. E. Baker, of the York Haven Paper Co., reported a fiber use efficiency of 98 per cent through the entire plant. Slime, which gives trouble in save-alls, can be reduced by frequent washings of the apparatus.

Bark and wood room scrap can be burned and one pound of steam can be made from a pound of bark 65 per cent dry by the use of a specially designed furnace. J. D. Rue, of the Forest Products Laboratory, showed that to be useful total moisture of material burned must not exceed 50 per cent. During the year a specially designed bark press for compressing and extracting moisture has been tested, with results showing that such a piece of apparatus is practical.

Broke or waste paper losses can be reduced by careful regulation of the consistency of the stock, by the analysis of records made regularly in each department, and most especially by maintenance of proper mechanical condition of machine.

Drying Losses Require Analysis for Prevention

To know what is happening to paper and to the bill for heat costs in drying, samples of paper should be taken at frequent intervals along the driers and tested for moisture. This work was carried out by Chairman S. B. Jones of the committee on drying, who plotted the results and presented them at the meeting. To reduce waste of heat, temperature must be regulated carefully in successive cylinders. Predetermined wet end moisture should be maintained and air circulation held within limits depending on control tests.

Norman Clark, having studied carefully the use of coloring matters for coated paper, finds that basic dyes usually fade due to the presence of alkali. Casein, which is usually used, also tends to precipitate the basic dye. Acid dyes are better as far as permanence is concerned but are less brilliant in color. Flat tones may well be obtained by use of insoluble pigments. Accurate control of pulp moisture in application is highly desirable. In discussing the desirable characteristics of a paper to be coated, Mr. Clark showed that the paper must be well formed, dirt free, of uniform color and thickness, free of slack edges, and of surface fuzz, that it should have the least possible finish required for uniform surfacing and that it should be leathery in "feel."

The relative merits of festoon and flat driers used in finishing of special coated papers were discussed by J. O. Ross. Festoon drying should be employed wherever space permits. Speed and width and the exact nature of the process determine the best system to employ. Throughout such processes accurate control of conditions is especially necessary to obtain economical production.

Newsprint Production Involves Grinder Development

The Groundwood Section Meeting under Chairman W. A. Munro held a symposium on Grinders. Magazine grinders must be employed and power input per unit increased if the man-per-hour production in the groundwood mill is to be efficient. The new chain-feed magazine grinder gives a more uniform grade of pulp and surpasses the pocket type of grinder in that it maintains constant pressure on the stone and constant load on the motor.

Screen rejections can be made into shipping wrappers. Two new refiners are being tested to turn these

screenings into No. 1 pulp. Success will make possible a closed system in the groundwood mill.

Use and standardization of the freeness-slowness tester now coming into use will make possible uniform grading of groundwood pulp and more accurate control of the product. White water can be re-used in groundwood manufacture.

Evaporation Problems Emphasized

Soda and sulphate men, meeting with G. K. Spence in the chair, agreed that no hard drawn lines can be drawn in solving evaporation difficulties. Boiling out at least once a week is necessary unless the liquor going to the evaporator is screened effectively. H. K. Moore advocates counter-current flow in multiple-effect systems, but many mill men find efficiency lowered by this procedure. Common practice in several mills is to introduce liquor into the second or third unit, thence to the first and finally to the fourth. Capacity required must be balanced against cost of steam and necessary exit temperature in deciding what type of evaporator best suits a given operation. Multiple-effect evaporators should operate at high vacuum and if proper conditions are obtained a double will evaporate 1.8 lb., a triple 2.7 lb. and a quadruple 3.6 lb. of water per lb. of steam consumed.

Excess use of bleach in bringing pulp to color can be avoided by knowing the history of the pulp. It must be cooked under exact conditions determined by test as best suited to wood in process. Thorough washing after blowing is the next essential. The bleach requirement, determined by test before the pulp reaches bleach system, should be largely added with the pulp at the start of the bleaching period. Under these conditions time and bleach required will be a minimum, according to G. M. Trostel.

The cause of color change in soda pulp on aging is shown by analysis to be the result of the building up of alkalis at surface by process of drying, etc. These alkalis, even in small quantities, will cause the change.

Light, Heat and Power Problems Most Essential

Freight rates will largely determine the possibility of substituting oil for coal as fuel. Oil is cheaper to handle and burn but more expensive to store.

H. S. Taylor, chairman of this section, led the discussion following J. O. Ross' thoughtful presentation of the problems of heat transfer in the machine room. Inside gutters on skylights and roof are essential. Skylights are a cause of inefficiency due to added amount of heat required to prevent condensation. Amount of air circulated, contrary to usual practice, should be balanced against amount of water being evaporated. Exit air should be held as close to dew point as possible. In general good operation should require a total about 4 lb. of steam per lb. of paper made. Hoods over machines will usually increase efficiency due to possible cutting down of live steam consumption.

In order to use steam and electricity to maximum advantage, according to recommendations of E. P. Gleason, these commodities should be measured in terms of units of output. Daily graphic records, weeding out of duplicate, wrong size or uncovered steam pipes, planning of load to keep it as constant as possible, avoidance of leaky traps and valves will reduce losses to a minimum.

Frictionless bearings are being used to an increasing extent because of the smaller amount of attention required and the increased speed obtainable by their use. Felt life may be increased by doing away with gear drive of rolls, since such arrangement sets up undue strains in the felt. Power consumption and lubrication difficulties are likewise lessened by use of ball bearings.

Froth troubles in the mill can be decreased by the use of a moving spray on the head box of the machine, by the moderate use of an oily medium in the washing of the pulp, by careful preliminary cooking and by careful avoidance of carbonates in presence of alum.

Paper Industries Expositior

The first Paper Industries Exposition, held at Grand Central Palace, New York, during the week of April 9 to 14, demonstrates another step of progress in the history of the paper industry. First conceived as a means of bringing the various branches of the industry closer together, this first Paper Exposition succeeded in a larger measure by showing the public a cross-section of the complex workings of the mills in the fabrication of this commonest of commodities. Larger in size than the first Chemical Industries show, according to the management, the first Paper Industries Exposition has shown what a single industry can do in this regard.

Despite the fact that there were empty booths, neither the layman nor the paper man could well be disappointed in the exposition. The story of paper was very well told. Nor did the exhibits end by showing paper and paper materials in their many ordinary forms. Tapestry, furniture, twine, fiber commodities, curiously shaped dishes, containers of broad utility, bags, boxes and bottles of all forms were on display as well. One exhibit showed those products which come largely from wood pulp or ground wood such as artificial silk, celluloid, and products having a wood flour base such as talking-machine records. Another showed what byproducts may be obtained from Southern pine wood when used for pulp, including rosin, pine oil, turpentine, tar oils, pitch and acetic acid.

Among the many exhibits, a few stood out especially. The Hammermill Co. demonstrated the fabrication of paper by a complete series of samples and illuminated panels at various stages of the process. The Nash Engineering Co. and the Sandusky Foundry & Machine Co. had bronze models of pumps and of couch rolls respectively, which because of size and remarkable workmanship were conspicuous. Bearings were well displayed by the S.K.F. Co. and by the Gurney Co., each using unusual mechanical ingenuity to demonstrate its products. The Mathieson Alkali Co. showed a small model of a modern bleach plant, and the Bird Machine Co. demonstrated its save-all in action.

In discussing the exposition with various exhibitors, it was the general feeling that considerable machinery had been sold, enough to cancel the expense of exhibiting; but, as expected, the chemical firms would have to call it advertising.

Correction

Through an error Dr. C. N. Viol was referred to as "Director, the Vanadium Company," in our issue of April 16. He is Director of Radium Research Laboratories of the Standard Chemical Co.

Colloid Chemists Hear Donnan on Membrane Equilibria

A Feature of Physical and Inorganic Division Meeting at New Haven—Other Papers of General Interest

AN outstanding feature of the symposium on colloids held by the Division of Physical and Inorganic Chemistry at New Haven, April 6, 1923, was a paper read by Prof. F. G. Donnan of London on "Membrane Equilibria." In the experiments described by Professor Donnan he used a copper ferrocyanide gel membrane supported by parchment. Solutions of various electrolytes were in turn placed on either side of the membrane and after a definite lapse of time the solutions were analyzed and the migration in either direction determined. Very close agreement was obtained with the theoretical equilibrium governing the concentration of the various ions in either solution. For example, in the case of sodium ferrocyanide on one side of the membrane and calcium ferrocyanide on the other, the cations alone diffusing through the membrane, the ratio of the two calcium concentrations, Ca_1/Ca_2, agrees splendidly with the ratio of the square of the two sodium ion concentrations, $(Na_1/Na_2)^2$:

Experiment	1	2	3	4	5
Ca_1/Ca_2	1.27	1.76	1.37	1.80	1.55
$(Na_1/Na_2)^2$	1.25	1.76	1.33	1.78	1.50

The sodium ratio is "squared," since for every one calcium ion that permeates through the membrane in one direction, two sodium ions must permeate in the opposite direction.

If only one ion moves through to one side and not the equivalent ion or ions the other way, then potential differences are set up, although these are very small. Professor Donnan's experimental results and the equations derived are all in full accord with our ideas and principles of adsorption and in general with thermodynamic principles.

Behavior of Pigments in Oil

Another interesting paper of the colloid symposium was entitled "Plasticity in Colloid Control," by Prof. Eugene C. Bingham and Alfred G. Jacques of Easton, Pa. The authors referred in particular to the behavior of pigments in oil. As an illustration it was shown that lithopone in linseed oil gave a yield value of 128, whereas in mineral oil the yield value was 1010. The respective fluidity values were 2.4 and 2.1. An interesting demonstration was the difference in elasticity and plasticity of two samples of sodium silicate. The one sample with one part of Na_2O to four of SiO_2 was very plastic but not elastic, whereas the second sample, composed of two parts of Na_2O to three of SiO_2, was very elastic but not plastic.

Adsorbent Gels

A paper of decided practical bearing was that by Prof. Harry N. Holmes and J. Arthur Henderson of Oberlin, Ohio, on the preparation of highly adsorbent gels. The authors slowly add a solution of ferric chloride to a water-glass solution, obtaining a deep yellow gelatinous precipitate, which is washed, dried, then activated at 145 deg. At 30 deg. it adsorbed 31 per cent of its own weight of benzene from a stream of air saturated with benzene. A precipitate dried at 50 deg. until hard before washing gave a gel of 43.1 per cent adsorptive power. A similar gel dried hard and then soaked with dilute HCl to convert the iron oxide into chloride was washed and activated. It adsorbed 49.3 per cent benzene. This was white silica gel. The product purchased from the Silica Gel Corporation adsorbed 33 per cent benzene. With xylene a similar higher adsorption was obtained. However, with sulphur dioxide there was practically no difference between the adsorptive power of Patrick's silica gel and the authors'. As regards the chemical constitution of the original iron-silica gel, this seems to be a mixture rather than a compound, otherwise the iron oxide would not dissolve out readily during treatment with HCl.

Rubber Chemists Hold Successful Meeting

More Than Two Hundred Present at New Haven Sessions—Goodyear Memorial a Delightful Feature

THE meeting of the Rubber Division of the American Chemical Society at New Haven, April 5 and 6, was unquestionably one of the most successful meetings which this division has ever held. Attracted by a program containing many interesting and valuable papers, and the knowledge that Prof. Giuseppe Bruni, the distinguished Italian chemist, would be present and read a paper, rubber chemists to the number of about 200 turned out to the meeting. Valuable as were the papers which the authors presented to the meeting, their value was enhanced not a little by the careful attention with which they were received, and the interesting discussions which followed.

Goodyear Dinner

The Rubber Section had its first dinner party at the Lawn Club on April 5, and made it a delightful post-prandial spirtualistic séance instead of the usual speech-making. Mrs. Ellwood B. Spear came in and took her place at one end of the dining hall as "Medium Para." Straightway she went into a trance and called one ghost after another to appear at the other end of the room. The first was that of Charles Goodyear of New Haven, impersonated by Dr. Spear. He told the story of his invention of vulcanizing, of his many trials, and finally how he spent his declining days, always seeking new uses for rubber, although he died poor. Next Thomas Hancock, the English inventor of vulcanized rubber, materialized, and he told his story. Next Jan van Guens, the Dutch claimant for the invention, announced his claims with characteristic Dutch vigor. G. Stafford Whitby impersonated Hancock, and Winfield Scott was van Guens. The part of Thomas Rowley, who was the first to apply accelerators, was taken by C. W. Bedford, and finally Christopher Columbus in the person of C. Olin North, claimed to have discovered the place where rubber comes from, and demanded a proper recognition from the Rubber Section. It was an entertaining show and historically instructive.

Important Technical Papers

Space limitations preclude a discussion of all of the important papers discussed by the division, but it is believed that the following notes are of general interest:

Dr. H. L. Fisher summarized the recent work which has been done on the composition of crude rubber and pointed out that the exactness with which the work of

Pummerer and Burkhard was done justified our accepting their conclusions that the formula for rubber was not $C_{10}H_{17}$, as has recently been claimed, but that the rubber nucleus is really C_5H_8.

In addition to a review of his recent work on vulcanization accelerators, Prof. Giuseppe Bruni talked at some length on the various problems being studied at his laboratory in Milan. One of these was on the subject of tearability, having reference to the work of Zimmerman, Tuttle and others in this field. It may be noted that this field is one which only in the past few months has been considered by the rubber chemists, and results of considerable interest and value have been brought out. Other work deals with the effect of temperature upon the determination of the tensile properties of vulcanized rubber, the purpose of the investigation being centered about the determination of a constant that will permit of correction being made for the temperature at which the tests are made. If such a constant can be worked out, tensile tests would then be referred to a constant temperature and thus make such tests easier of comparison. Professor Bruni has also been working upon the subject of the dispersion of crude rubber, with special reference to the work on this subject which has been published by J. B. Tuttle. Touching upon the subject of organic accelerators, Dr. Bruni brought out the point that the matter of most interest to them was the temperature at which the accelerators became active. He described briefly a method which he had employed for the determination of this effect.

Action of Litharge and Organic Acids

In previous work L. E. Weber had shown that when the resins of rubber are removed by solution in acetone, such extracted rubber shows a very poor cure when vulcanized with inorganic accelerators such as litharge. C. W. Bedford and H. A. Winkelmann gave the reason for this behavior. They showed that such extracted rubber will attain the normal vulcanization when there is added 1.5 to 2 per cent of such organic materials as oleic acid, stearic acid, pine tars, etc. This is particularly noticeable in the lower grades of rubber, in which there is a comparative deficiency of normal organic acids. The addition of a small amount of oleic acid to such rubbers materially increases the tensile properties when litharge is used as the vulcanization accelerator. They conclude from this that such a reaction is the true explanation for the improved results obtained when low-grade rubbers are vulcanized with the aid of lead oleate, but they point out that in such cases only a small amount of oleate is necessary for the purpose. They conclude that a material will not accelerate as an inorganic accelerator unless it is able to form a definite compound with the acetone soluble constituents of the rubber, and further that the resultant compound must be soluble in the rubber.

E. Hopkinson described L-S rubber, a new crude rubber obtained by spraying rubber latex on a rapidly revolving disk, the rubber spray being dried by a current of warm air. The resultant rubber sponge is compressed for purposes of shipment. This rubber contains all the solid substances of the latex, being high in water-soluble constituents (around 6 per cent). When vulcanized with the formula 90 per cent rubber, 10 per cent sulphur, this L-S rubber shows a much more rapid cure than is obtained under similar conditions with the ordinary smoked sheets or pale crepe.

Manufacture of Sulphuric Acid and Acid Phosphates During 1922

That a large increase in the production of sulphuric acid and acid phosphates occurred in the last half of 1922 over the first half of 1922 is apparent from the report of the Department of Commerce that has just been issued. From July 1 to Dec. 31, 932,747 net tons of sulphuric acid was used in the manufacture of fertilizer, while in the first 6 months of 1922 only 657,062 tons was used. The stocks of sulphuric acid on hand at the end of the year and at the beginning were substantially the same.

The concerns producing acid phosphates report the manufacture of 1,589,483 tons, containing 26,507,858 units (a unit is equal to 20 lb.) available sulphuric acid, during the second half of 1922, as compared with 1,198,724 tons, containing 20,104,992 units, during the first half, which makes a total production of the year of 2,788,207 tons containing 46,612,850 units. The stock of acid phosphate on hand at the end of the year amounted to 1,689,562 net tons, as compared with 2,129,339 tons at the beginning of the year.

FERTILIZER INDUSTRY: SULPHURIC ACID STATISTICS, 1922.
(Ton, 2,000 lb.)

United States	Full Year	First Half Jan.-June	Second Half July-Dec.
On hand at beginning of period	131,516	131,516	.....
Manufactured (made in plant reporting)	1,423,917	574,013	849,904
Purchases*	544,277	249,345	294,932
Sales:			
To fertilizer manufacturers*	246,544	99,719	146,825
Other than to fertilizer manufacturers	125,493	85,134	40,359
Used in making fertilizers	1,589,809	657,062	932,747
On hand at end of period	137,864	.....	137,864
Southern District			
On hand at beginning of period	66,774	66,774	.....
Manufactured (made in plant reporting)	581,327	199,471	381,856
Purchases*	280,891	113,869	167,022
Sales:			
To fertilizer manufacturers*	72,143	24,023	48,120
Other than to fertilizer manufacturers	31,393	24,444	6,949
Used in making fertilizers	747,014	273,739	473,275
Per cent of U. S. total	47.0	41.7	50.7
On hand at end of period	78,442	.....	78,442
Northern and Western Districts			
On hand at beginning of period	64,742	64,742	.....
Manufactured (made in plant reporting)	842,590	374,542	468,048
Purchases*	263,386	135,476	127,910
Sales:			
To fertilizer manufacturers*	174,401	75,696	98,705
Other than to fertilizer manufacturers	94,100	60,690	33,410
Used in making fertilizers	842,795	383,323	459,472
Per cent of U. S. total	53.0	58.3	49.3
On hand at end of period	59,422	.....	59,422

*Transfers from or to other plants of the same company are reported as purchases or sales, as the case may be.

In order to get an idea of the geographical distribution of the business done, the states were divided into two districts "Southern" and "Northern and Western," the Southern comprising all those states south of the Virginia-North Carolina line—namely, North and South Carolina, Georgia, Florida, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma and Texas. The remainder of the country designated is "Northern and Western" district. The Southern district reports 50.7 per cent sulphuric acid used in making fertilizer during the last half of the year, compared with 41.7 per cent for the first half; for the year the amount used was 47 per cent. With respect to acid phosphates the Southern district reports 30.1 per cent of the sales for the second half of the year, as compared to 56.9 per cent for the first half and 48.3 per cent for the year.

The data are compiled and made up from the reports of 198 fertilizer establishments, of which 127 are in the Southern district and 71 in the Northern and Western district. Of these various establishments sulphuric acid is manufactured in 71; 39 in the Southern district and 32 in the Northern and Western district.

The World Oil Situation

International Co-operation Is Prerequisite in Solving the Intricate Problems Surrounding the Economic Exploitation of Petroleum

SOME of the very significant international problems surrounding petroleums are discussed by A. C. Bedford, chairman of the board of directors of the Standard Oil Co., in an article in *Foreign Affairs*. After a word of introduction picturing the significance of petroleum in modern civilization, he mentions two vital factors, the importance of which are increasingly recognized. The first is that man cannot manufacture oil, and the second is that the world's supply of oil is not inexhaustible. A consideration of these facts convinces one that it is essential to develop a constructive method of handling the problem. A nation, or an aggregation of capital, must not attempt to control or use the supply in an uneconomical manner. Co-operation on the part of the people in the world, both in exploiting and utilizing the oil resources, is necessary.

Some Complicating Abnormalities

A number of complicating factors have entered the industry within the past few years, and may be classed as abnormal factors in the situation. They exist primarily in Russia and in Mexico, which, next to the United States, are the two most important oil-producing countries in the world. In Russia, since the Soviet Government has confiscated all private property, including that of alien capital, there has been a steady reduction in the output of oil and an absolute drop in the development of facilities for oil production. There is imperative need of private capital in the Russian field, and yet no private capital is likely to be attracted to Russia until some of the rights of previously invested capital have been recognized. In Mexico a somewhat similar, though not nearly so aggravated, condition exists. Confiscatory provisions in the Constitution menace American enterprise. On the other hand, a much more serious condition has arisen because of the recent exhaustion of the two important Mexican fields. At least two-thirds of the estimated producing area has already been abandoned, and this means that under the most ideal conditions, the collective loss will be at least half the original investment. In France and Italy some other abnormal tendencies aiming toward a government supervision or monopolization in the oil business constitute a danger. For if a government engages in private business which competes with the private industry of other countries, a difficult and unstable international relationship is likely to exist. Fortunately, both France and Italy have recognized this condition and abandoned the idea.

The Perspective of Normal Problems

The broader and more normal aspect of the situation presents another set of problems. In the first place, it must be recognized that the strategic factors, or those which would tend toward a national monopoly of oil fields, are not of primary importance, because of the very nature of the industry. Sensational writers to the contrary notwithstanding, the great nations of the world are not engaged in an insatiable search for oil to run flying machines, warships, armored tanks, etc., alone. It is fundamentally a question rather of progress in civilization than of its destruction. To get some idea of the proper perspective in this problem some facts must be understood. It should be recognized that the United States contributes about 70 per cent of the world's current petroleum production. It is not only the largest producer but also the largest consumer, and 1923 reports indicate that more than 12,000,000 motor cars and trucks will have to be supplied with gasoline and oil. This takes no account of motorboats, airplanes and marine engines which use quantities of oil. In addition to home consumption America supplies a substantial part of all petroleum used in Great Britain, France, Italy and Germany. American oil is also well known in the Far East, particularly in India and China. It may be regarded as a most important manufactured article entering into the export trade in the United States. But it is not merely a matter of distribution, for the oil must be found before it can be distributed, and no one can ever tell where it will be found. That is an important reason why the oil business does not and cannot take on the character of a public utility. For that very reason the oil industry has remained essentially a free industry, for its nature prevents monopolization or group control.

"The Problem of the Open Door"

The discovery of oil in Russia, Persia, Dutch East Indies, Mexico and South America has developed the present international oil problem, which in so far as it is political may be described as "the problem of the open door." The United States has an acute interest in the question around which revolve all the international controversies which have arisen over the world. The problem cannot be viewed in a narrow way and must be solved by considering the interests of all. Oil is a mining business. The profits are spectacular and uncertain, and because of this and of the uneven distribution no one interest is likely to concentrate in any one field. Take for example the present problem in Mesopotamia, where oil is an unknown quantity and the development of pipe lines alone would make a very considerable investment. No single unit could afford to assume the risk of so great a loss. It is essential, when developing fields of that kind, that a co-operation of interests be effected. All that our government has tried to do is to secure for Americans the same commercial rights and opportunities in other countries that we grant to nationals of those countries in the United States.

In some instances there has been considerable discrimination by foreign governments against citizens of this country, notably by the governments of Great Britain, Netherlands, in the fields of India and Dutch East Indies, and in the San Remo agreement between Great Britain and France. This was pointed out by the Federal Trade Commission last month. The United States Government has made it clear that it has no desire to interfere in the political relations of any power with a colony, protectorate or mandated area, but whenever it has been proposed to use such relations for the creation of exclusive economic spheres, then our country has protested. Such a policy as we are committed to is just and fair. To proceed on a less comprehensive theory would result in failure. The welfare of mankind is in no small degree dependent on the world's attitude toward the petroleum industry and the petroleum problem, and these must be dealt with in a spirit of the broadest understanding and co-operation by all peoples.

Machinery and Appliances for Production and Control

Equipment News

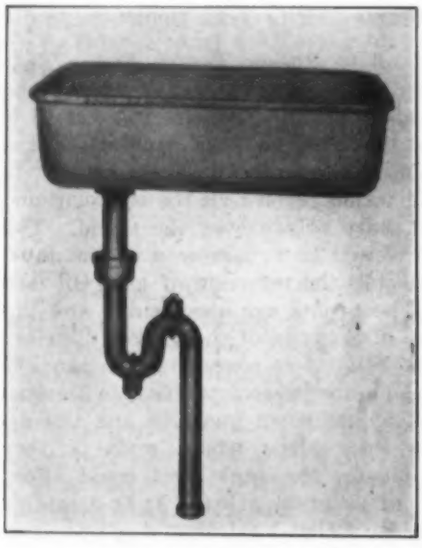
From Maker and User

Materials and Accessories for Chemical Industries

Sink Outlet

The Duriron Co., of Dayton, Ohio, has had on the market for a short time an acid-proof sink outlet which has not previously been called to the attention of chemical engineers.

This outlet is for use with acid sinks and can be used with wood, Alberene stone, stoneware, or Duriron. It is all Duriron except the locknut, which does not come into contact with the acid.



SINK OUTLET IN PLACE

The accompanying photograph shows the outlet when assembled with an iron acid sink and trap. The outline drawing shows the outlet in detail. This outlet is described by the manufacturer as follows:

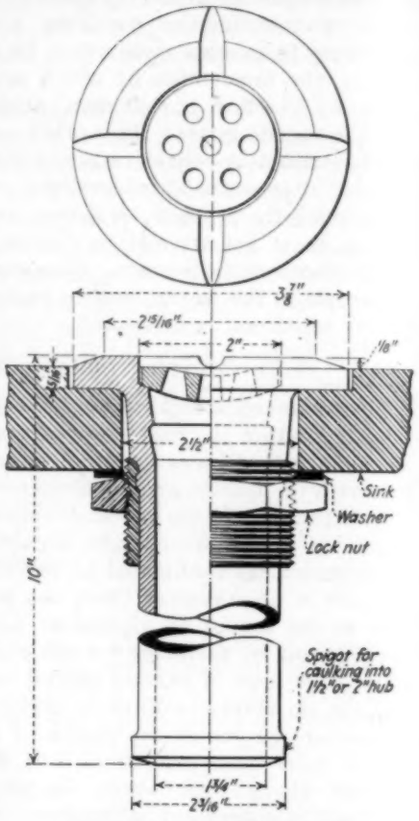
The upper flange of the outlet is imbedded in an acid cement, such as glycerine and litharge, in the proper recess in the bottom of the sink. Note this recess should be $\frac{1}{8}$ in. The washer and locknut are then applied, drawn up tight, and a permanent connection is made.

The wrought-iron nipple cast on the outside of the Duriron does not come in contact with any acid. The strainer is a loose piece, and can be removed readily for cleaning purposes.

The top of the flange is beveled upward from the edge; four grooves providing for complete drainage of the sink. This design adds strength to the connection at the proper point, and keeps filter papers from floating over the outlet and stopping it up.

The spigot end is calked in the hub of trap in the usual manner, using asbestos rope and lead.

The cost of this connection is low, considering the saving in time in making a permanent acid-proof joint; and expensive lead work and wiped joints are eliminated. This sink outlet will connect either to 1½- or 2-in. trap. It is carried in stock for immediate shipment.



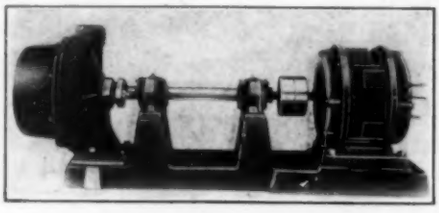
DESIGN OF SINK OUTLET

Ball-Bearing Self-Priming Pump

A new ball-bearing, self-priming, centrifugal pump has recently been placed on the market by the Fulflo Specialty Co., of Blanchester, Ohio. This pump has a capacity of 75 gal. per minute. Its makers recommend it for use with oils, brines, enamels, cooling liquids, compounds and other similar materials.

The features of this pump are those already embodied in the smaller pumps marketed by this company. Self-priming is attained by having the outlet and the inlet above the level of the pump so that the liquid being pumped remains in the pump when it is stopped. This makes it necessary to prime the pump only when starting for the first time.

Clogging of the pump is prevented by having the openings in the impeller as large as the inlet, so that anything entering is free to flow through. Clearances are ample so as to reduce wear to a minimum. The accompanying illustration shows this new pump direct connected to a motor mounted on the same base.



75 G.P.M. DIRECT-CONNECTED FULFLO PUMP

Catalogs Received

DENVER FIRE CLAY CO., Denver, Colo.—Leaflet describing the DFC crushers for laboratory use. A small laboratory crusher made in two sizes, 1 and 2 hp., for use in crushing various materials for laboratory experiments.

J. H. DAY CO., Cincinnati, Ohio—Catalog 400. This catalog, entitled "Paint Machinery," is a new issue descriptive of the complete line of paint machinery, including various types of mills, mixers, cutters, kettles, chasers, fillers and other equipment used in the paint mill.

FRANKLIN FILING SUPPLY CO., 70 Duane St., New York City. Leaflet, "The Oxford Flexindex," descriptive of this company's method of indexing correspondence and data.

BAUSCH & LOMB OPTICAL CO., Rochester, N. Y.—Catalog describing the Bausch & Lomb contour-measuring projector, a device used for measuring contours of mechanical parts by optical projection of the magnified image.

COMBUSTION ENGINEERING CORPORATION, New York, N. Y.—Catalog on the Combusco Ash Conveyor, descriptive of new type of water-sealed drag chain ash conveyor, which has been introduced in this country recently by the Combustion Engineering Co. for the purpose of handling ashes from boilers in power houses.

Book Reviews

ELECTRIC BRASS FURNACE PRACTICE. By *H. W. Gillett* and *E. L. Mack*. 334 pp., 70 illustrations. Government Printing Office, Washington, D. C.

This publication (Bulletin 202 of the Bureau of Mines) records the progress so far made in melting brass in electric furnaces. It is designed to aid plants that have not installed such melting practice by pointing out the types of furnaces available, describing their performance and indicating their possibilities and limitations.

Messrs. Gillett and Mack have been in a unique association with the development of electric brass melting since the first commercial experiments in the United States. They are enabled to draw upon a wide experience and extensive notes of actual experiments in a way that brings out very clearly indeed the troubles encountered in developing the art. They describe the failures and the first halting steps. It is very seldom that an unsuccessful experiment is adequately described, although full information about such is nearly always far more instructive than an account of a successful operation. A perusal of these pages, therefore, will be of the greatest benefit to anyone who is attempting to design an electric furnace for a new alloy or an untried service.

Crucible furnaces heated by electric resistors were first tried, probably because the designers attempted to approximate the conditions existing in an ordinary melting hole. One attempt after another led to failure, and finally the designers turned to a hearth furnace, where the molten metal is contained in a basin rather than in crucibles, the laboratory being heated by various kinds of electrical resistors. This type of furnace quickly demonstrated that it had all the advantages of the crucible type—namely, production of high-quality metal with a low loss—with none of its disadvantages.

Fundamentals of successful commercial operation are discussed carefully: namely, the metallurgical fitness of a furnace, its reliability, a high rate of production, a good thermal efficiency, electrical characteristics that will not derange the entire supplying system, and finally a reasonable operating cost. Following some sound ideas to their correct conclusion, the authors were enabled to design a rocking furnace which was patented, and has, during the last 5 years, been manufactured and marketed by the Detroit Electric Furnace Co. This furnace, together with a very similar design made by E. H. Booth, has supplied to the large majority of users now making electric brass in the United States, and melt perhaps one-half the total tonnage. This furnace, however, is by no means given the lion's share of attention, and all of the present commercial furnaces are described in as much detail as necessary, giving figures for the operating characteristics, capacities, metal losses, and cost. A final chapter covers the electric melting of aluminum, copper and rarer alloys.

Altogether, this is a book that will not only prove most valuable to a prospective user of electric furnaces but will be eagerly read by all students of electric furnace design.

E. E. THUM.

THE PRINCIPLES OF RADIOGRAPHY. By *J. A. Crowther*. vi + 138 pp., illustrated. D. Van Nostrand Co., New York. Price, $2.

When the reviewer picked up this volume he hoped it would be the book to fill the need which he experienced when in 1907 he taught Radiology in the Medical Department of the American University at Beirut. This hope was encouraged by the standing of the author as a physicist and his position as University Lecturer in Physics applied to Medical Radiology at Cambridge, England.

In some respects the book meets expectations. The material is set forth briefly in a manner readily grasped by the intelligent but non-technical reader. But it is to be wished that, instead of confining attention to Radiography, it had covered the entire field of Radiology and so included the important region Radio-Therapy. Had this been done, we feel certain that more consideration would have been given to the so-called "interrupterless" equipments and their very decided advantages, and to the important properties of the Coolidge tube. As it is, the reader is led to believe that the alternating current transformer is an unsatisfactory source of power and that the Coolidge tube, in spite of its many advantages, is not convenient nor comparable with the gas-filled tube. For instance, on page 81 he says of the Coolidge tube: "Its main disadvantage, besides cost (which is very high), is the necessity for the auxiliary battery and apparatus. The accumulator cells need careful attention and frequent charging, and of course must be carefully insulated." There is no mention of the use of a transformer to supply the filament current, although this is now the common practice. If this omission is due to ignorance it is amazing, considering the author's position; if intentional, it is unpardonable.

There are other sins of omission, such as the failure to mention the use of films, double intensifying screens and cellular diaphragms between the patient and the film. The importance of protecting patient and operator is not stressed sufficiently and according to the reviewer's experience the protection mentioned is scarcely adequate. In comparing the X-rays generated by different sources of power the results published by Dr. A. W. Hull showing that with the same maximum voltage the energy distribution is practically the same have been overlooked or ignored.

These defects are so glaring that the book picked up with hope was laid down with disappointment.

ANCEL ST. JOHN.

AMERICAN FUELS. By *R. F. Bacon* and *W. A. Hamor*. 1245 pp., 382 illustrations. Two volumes. New York City: McGraw-Hill Book Company, Inc. Price $12.

This two-volume work brings together important material from a number of well-known authors whose opinions are always highly regarded. It is particularly valuable to the man who wishes to study the processing of fuels, for the chapters on technology of coke, briquetting of fuel, distillation of coal at low temperature, producer-gas technology, water gas, the Dayton process and others are of very great value. In fact, if these were the only chapters of the book, the contribution could not help finding most cordial welcome among fuel engineers.

Since the work is the composite of contributions from about twenty authors, it is not strange that there is considerable diversity in treatment and some variation in the value of the different chapters. However, any work including contributions by men like Sperr, Coffin, Blake and the other prominent authors is certainly as a whole worth while. Some of those chapters which in the present first edition do not come wholly up to the standard set by these more experienced writers will doubtless be strengthened in later editions so that in every respect the book can be of maximum usefulness.

The object of the volume as stated by the authors in their preface is to assist in "deciding upon the most suitable fuel to use or the changes to make in the utilization of fuel or of heat in order to get the highest efficiency in plant operation." In some respects, however, the reader must bear responsibility for decision on his own shoulders, as most of the authors are enthusiastic supporters of the form of fuel or method of processing about which they write. This is but a natural result of the fact that each is an expert in his particular line and therefore naturally enthusiastic about those materials or processes with which he has had the maximum experience. As a consequence of this practical experience on the part of the authors, the reader can be sure that he is getting reliable and usable information, not at all of an academic or theoretical sort. This advantage largely outweighs any overenthusiasum on the part of the several writers.

The authors have been most successful in eliminating from the work the impression that it is simply a composite "catalog," a failing all too common in works on mechanical engineering and fuels. The illustrations are well chosen and well presented, having in almost every case a significance as to types of equipment rather than any specialized significance with reference to parti ular makes of machinery or varieties of process. As a consequence not only the experienced but also the inexperienced engineer will find profitable and safe guidance in the work. The volumes should certainly be available in any library that makes a pretence of covering the subjects of fuels or technology.

R. S. MCBRIDE.

Synopsis of Recent Literature

Ammonia Losses in Carbonization

H. D. Greenwood in *Gas Journal* of March 21 (page 750) discusses this subject in some detail. He summarizes his conclusions as follows:

"It is evident that the most important factor is the rapid removal of the ammonia from the hot retort. The temperature of maximum ammonia evolution (about 800 deg. C.) corresponds with the temperature at which the evolution of hydrogen is also at a maximum, hence the ammonia is formed under the most favorable conditions as regards its gaseous atmosphere. The introduction of air and flue gases into the retort will increase the percentage of nitrogen in the gases, and may tend to increase the loss of ammonia by dissociation. An ideal condition for the preservation of the newly formed ammonia would be to maintain a certain percentage of moisture in the gases throughout the distillation, which condition is to some extent attained in steaming vertical retorts, where the steam may play a double rôle in increasing the initial formation of ammonia and in maintaining an atmosphere rich in moisture and hydrogen. From the results of recent research it appears probable that the ammonia yields in practice may be considerably influenced by the character of the coal ash, and to a lesser degree by the type of refractory material used; and the former factor may conceivably bear some relation to the widely different yields which are obtained from coals containing the same percentage of nitrogen and which are generally similar in character."

Buildings From the Manager's Viewpoint

The location, size and design of entrances, stairways and windows in factories are of paramount importance to efficient production and industrial safety. To obtain the most satisfactory service from these very necessary parts of the building, a manager in planning a new structure should keep in mind the factors pointed out by G. L. H. Arnold in his paper on this topic in *Management Engineering* for April, 1923. This is the second paper of the series, the first of which appeared in March.

Entrances. These should be located to avoid all conceivable hazards, as those caused by tracks and roadways. Care should be taken that entrances be not blocked in case of fire. The nature and extent of traffic through the entrance must be considered and the entrances located to avoid cross-currents and complicated routing.

There should be at least one entrance for each stairway. At least one entrance should be large enough to admit the largest piece of apparatus whose use can be foreseen. Doors should open outward for safety, and space allowed outside to permit full and safe opening. Entrance ramps should not exceed 7½ deg. slope and should be provided with anti-slip treads.

Stairways. The principal considerations in specifying stairs for an industrial building are: (1) Safety of employees in daily use. (2) Safety of employees in emergency use. (3) Safety of building in case of fire. (4) Convenience for daily use. (5) Effect on heating and ventilation. (6) Space occupied. (7) Cost.

Building codes usually govern the number of stairways. In the absence of a code, one stairway should be provided for each 5,000 to 6,000 sq.ft. of space except in special cases. In any case there should be at least two stairways. In considering stairways with relation to number of employees, there should be one 4-ft. stairway for each 250 persons using it.

Every stairway should communicate directly with an exit. The floor at the head and foot should always be level. Landings should be rectangular and as deep as the stairs are wide. A 7½-in. rise and 9-in. run is best practice in most cases. The general rule is length of run plus twice the rise equals 24 to 24½ in. The tread should be 1½ to 1½ in. wider than the run. The best width is 44 to 48 in. between hand rails. A headroom of 7 ft. is a minimum. Safety treads 4½ to 5 in. wide are good practice. Open stairways should be avoided.

Windows. In placing windows the chief considerations are illumination, ventilation, spread of fires and appearance of buildings. It is well to have the window as near flush with the outside of the wall as possible.

The type of windows used largely depends on the extent to which they are depended on for ventilation. The double sliding sash and the double balanced pivot types are good where windows furnish most of the ventilation. Where the windows are not called on to supply much ventilation, the fenestral type with pivoted ventilating sash are cheaper and give better lighting. Casement windows are not recommended for industrial buildings.

Tests for High-Temperature Refractories

In changing from coal to oil firing for warships, the Navy Department encountered such difficulties from the failure of refractories used in boiler linings under the high furnace temperatures that it became necessary to establish new testing methods in order to obtain satisfactory brick. G. M. Galvin, of the Navy Department Fuel Oil Testing Plant, describes these tests under the title "Solving the Refractories Problem of the Navy" in the

Important Articles in Current Literature

More than fifty industrial, technical or scientific periodicals and trade papers are reviewed regularly by the staff of *Chem. & Met.* The articles listed below have been selected from these publications because they represent the most conspicuous themes in contemporary literature, and consequently should be of considerable interest to our readers. Those that are of unusual interest will be published later in abstract in this department; but since it is frequently impossible to prepare a satisfactory abstract of an article, this list will enable our readers to keep abreast of current literature and direct their reading to advantage. The magazines reviewed have all been received within a fortnight of our publication date.

REPORT II OF THE COMMISSION ON RESUSCITATION FROM POISONING BY MANUFACTURED GAS. Cecil K. Drinker, M.D., and Walter B. Cannon, M.D. *American Gas Association Monthly*, p. 195, April, 1923.

CAPACITIES OF CONSUMERS' METERS. Walton Forstall. *American Gas Association Monthly*, p. 255, April, 1923.

SULPHUR COMPOUNDS OTHER THAN HYDROGEN SULPHIDE IN GAS AS A FACTOR GOVERNING THE SELECTION OF GAS COALS. J. B. Craven and W. A. Dunkley. *American Gas Association Monthly*, p. 251, April, 1923.

ACTION OF SLAG UPON SILICA, MAGNESITE, CHROME, DIASPORE AND FIRECLAY REFRACTORIES. R. M. Howe, S. M. Phelps and R. F. Ferguson. *Journal American Ceramic Society*, April, 1923. pp. 589-595.

METALLURGICAL REQUIREMENTS OF REFRACTORIES FOR FURNACES MELTING COPPER ALLOYS. H. W. Gillett. *Journal American Ceramic Society*, April, 1923, pp. 596-609.

PROBLEMS OF CONTINUOUS KILN BURNING. Mark A. Taylor. *Brick and Clay Record*, April 3, 1923, pp. 597-598.

BUILDING FROM THE MANAGER'S VIEWPOINT, Part II. G. L. H. Arnold. *Management Engineering*, April, 1923, pp. 229-234.

QUALITY CONTROL IN THE MANUFACTURE OF CEMENT. G. E. Warren. *Management Engineering*, April, 1923, pp. 265-266.

SOLVING COST AND ECONOMY PROBLEMS BY GRAPHS. J. A. Brown. *Management Engineering*, April, 1923, pp. 251-254.

THE THERMAL EFFICIENCIES OF PRODUCTION OF DIFFERENT GRADES OF GAS. A. Parker. *J. Soc. Chem. Ind.*, pp. 111-117T., March 23, 1923.

STUDY OF THE SOLVENTS OF SOME CELLULOSE ESTERS. E. W. J. Mardles. *J. Soc. Chem. Ind.*, pp. 127-36T, March 29, 1923.

THE MANUFACTURE OF SULPHURIC ACID BY THE CONTACT PROCESS. III, Processes for Purification of Sulphurous Gases. H. Braidy. *L'Ind. Chim.*, pp. 103-5, March, 1923.

COLORING OF PAPER. André Beltzer. *L'Ind. Chim.*, pp. 106-9, March, 1923.

SOME ASPECTS OF GASEOUS FUEL UTILIZATION. J. G. Clarke. *Gas Journal*, pp. 690 and 754, March 14 and 21, 1923.

THE VENTURI GAS METER. John L. Hodgson. *Gas Journal*, p. 752, March 21, 1923. Includes a history of its development.

A BRIEF REVIEW OF THE CRUDE DRUGS ENTERED AT THE PORT OF NEW YORK DURING THE PAST YEAR. L. J. Schwartz. *J. Am. Pharm. Assoc.*, vol. 12, No. 3, March, 1923.

PREMIER MILL IN CHEMICAL INDUSTRY. F. J. E. China. *Chemical Age* (London), March 31, 1923, pp. 329-330.

THE INFLUENCE OF COPPER SPRAYS ON THE YIELD AND COMPOSITION OF THE IRISH POTATO TUBER. F. C. Cook. Published as Department of Agriculture Bull. 1146, April 5, 1923.

Journal of the American Society of Naval Engineers for February, 1923.

The test described in Bureau of Standards Paper 10, somewhat modified, was adopted by the navy for determining fusion point. This modified test is conducted in a Hoskins type electric furnace, capacity to 3,000 deg. F., and Seger cones are used for pyrometric agents. The test consists of comparing Seger cones under heat with similar cones made of the material under consideration.

Refractory Specifications

As a result of examining some hundreds of brands of refractories purchased on the open market, the navy established its standard specification 50B6, covering workmanship and physical and chemical properties. The workmanship clause is general. The physical requirements set 3,100 deg. F. as the minimum acceptable fusion point for firebrick and 3,000 deg. F. for fire cement. A composition of approximately 54 per cent SiO_2, 41 per cent Al_2O_3, and not over 5 per cent total basic fluxes (Fe, Ca, Mg, K, Na), determined as oxides, constitute the chemical requirements.

The procedure in using these standard specifications is to examine a refractory for general characteristics and workmanship, to subject it to chemical analysis and to determine the softening temperature. This last is considered of major importance and final acceptance is based upon it.

The Simulative Test

After a refractory has passed the acceptance test described above, it is subjected to a simulative test, which duplicates, in so far as is possible, the conditions encountered in service. This test is conducted in a small oil-fired furnace. One side wall of the combustion chamber is constructed of brick and cement of the kind on which a test is desired, the opposite side wall of brick and cement already proved satisfactory. A compressed-air-atomizing fuel oil burner is used. The flame sweeps the length of the furnace, returns and escapes to the stack. The test comprises three runs at temperatures of 2,800, 2,900 and 3,000 deg. F. respectively, each of 24 hours duration.

During the test temperatures are ascertained at 15-minute intervals with a Morse optical pyrometer, sighting into the furnace above the burner. To compare the heat-insulating properties of the walls, temperatures of the outer faces are read each half-hour with the pyrometer sighting on the brickwork through sillimanite tubes, the ends of which are placed flush with the walls.

Immediately after each run a spalling test is conducted by injecting cold air at high velocity into the furnace until the walls are cool. Results are obtained by comparison; the comparative heat-insulating properties, together with the relative conditions of the competing sidewalls at the conclusion of the test, determining whether or not the material under test is acceptable.

On Beilby's Amorphous Theory

Sir George Beilby's views on the flow of solids and on the amorphous phase in metals, and more particularly his beautiful volume on "Aggregation and Flow of Solids," having attracted considerable attention and facilitated the generalization of these views, C. Benedicks, (*Revue de Métallurgie, Mémoires*, 1922, vol. 19, pp. 505-513), took occasion to draw attention to some important points, and, at the request of the *Revue de Métallurgie*, undertook to review critically the facts on which Beilby's theory is based.

In the author's opinion, some of the results obtained by Beilby may be explained without assuming the formation of a thin mobile amorphous skin or film in metals.

According to Beilby, the essential feature of polishing as distinguished from grinding is that the polished surface is formed by a kind of skin of vitreous material caused by *flow* of the superficial layers. Benedicks believes that it would follow from such theory that hard and fragile substances are more difficult to polish than the plastic ones. The experience, however shows the reverse. So, for instance, quartz is much easier to polish than the relatively plastic fluorite.

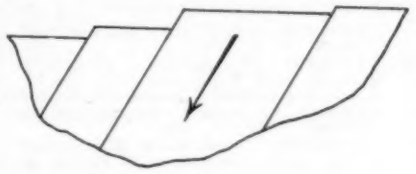


FIG. 1

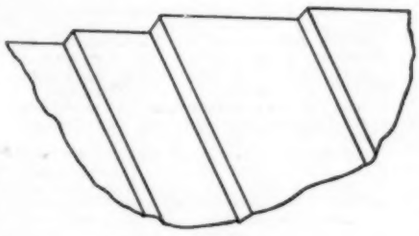


FIG. 2

FIGS. 1 AND 2—MOVEMENT BY TRANSLATION AND TWINNING, RESPECTIVELY

In the case of speculum metal, Benedicks observes that if the amorphous layer had really been the cause of the disappearance of scratches "partly filling them up and partly bridging them over" then a fortiori the network of the eutectic would have also been eliminated; however, Fig. 43 of Beilby's book shows that the structure remains perfectly visible.

Beilby finds in polished surfaces of pure metals, like antimony and copper, small rounded areas which he thinks are cavities roofed over with a thin film of a viscous layer. Benedicks rather ascribes these appearances to the presence of slag inclusions, Sb_2O_3 in antimony, or Cu_2O in copper. Since Cu_2O appears red in transmitted light but the complementary color blue in reflected light, microscopic inclusions of that oxide observed in an opaque ground like metallic copper will appear distinctly blue.

The most important application of Beilby's theory concerns the increase of hardness after cold work. In Benedicks' opinion, it is perfectly fair to assume that if the amorphous phase exists on the surface of a polished metal, it would also appear in the interior of a deformed metal. However, to consider the amorphous phase as being possessed of a great hardness is a quite new and distinct hypothesis and seems hardly to agree with facts. For instance, a bismuth filament drawn at ordinary temperature must become as amorphous as possible; that filament, however, is not hard at all. It seems, therefore, to the author, that the hypothesis of amorphous state does not appear to bring much light to the study of the nature of cold work.

In order to exonerate himself of a purely negative attitude, Benedicks advances the following theory not as yet published:

An originally plain surface after deformation may exhibit a "parallel translation" (Fig. 1) as shown by Ewing and Rosenhain, in which every particle slides over the next in the direction of the arrow, just as a pile of books or flat plates would. The same external shape "in steps" would, however, result from another regular deformation also known by crystallographers, the so-called "proportional translation" (Fig. 2). In this latter case there is no actual sliding, but rotation ("twinning") of the crystalline elements. The difference between these two kinds of movement is fundamental. In the former the space lattice remains identical, the optical properties remain the same and the amount of possible deformation is practically unlimited. In the latter, on the contrary, the space lattice is subjected to profound modification by the formation of twined lamellæ. This change is made apparent in polarized light; the amount of possible deformation is strictly limited by the angle of twinning. Thus, a metal, as for instance pure zinc, which deforms by "parallel translation," may be subjected to very great change of volume without any appreciable increase in hardness. On the other hand, the same zinc, containing some impurity as cadmium, twins, and thereupon deformation increases the hardness of the metal.

"Therm" Charges for Gas

The English authorities have been making a very extended investigation of the system of charging for gas on the basis of the "therm," 100,000 B.t.u. This committee has reported to the British Board of Trade recommending continuance of this system of charging, but providing for circulating additional information so that gas users will better understand it. The full text of the committee report is in *Gas Journal* (London), March 14, page 676.

Review of Recent Patents

Manufacture of Organic Oxides—In preparing organic oxides, such as propylene oxide and the oxide derived from trimethyl ethylene, by treating a chlorhydrin with an alkali, the yields may be increased by carrying out the reaction under as nearly anhydrous conditions as possible. Thus, the yield of ethylene oxide is only about 12 per cent theoretical when a 20 per cent solution of chlorhydrin is treated with 20 per cent caustic soda solution, while with 80 per cent chlorhydrin and solid caustic soda the yield is 83 per cent.

The process is carried out substantially as follows: A quantity of solid caustic alkali or calcium oxide is placed in an apparatus provided with means for stirring the contents, with an inlet for adding the chlorhydrin and an outlet through which the more volatile oxides may be distilled. The quantity of caustic alkali or lime taken should be in excess, preferably one and one-half to two times the amount theoretically required by the chlorhydrin. The chlorhydrin substantially free from water is then permitted to flow slowly in on the alkali, which is continually stirred to prevent caking and to effect good contact of the chlorhydrin with the alkali. In the case of ethylene, propylene and butylene oxides the heat of the reaction is sufficient to distill

American Patents Issued April 3 and 10, 1923

The following numbers have been selected from the latest available issue of the *Official Gazette* of the United States Patent Office because they appear to have pertinent interest for *Chem. & Met.* readers. They will be studied later by *Chem. & Met.'s* staff, and those which, in our judgment, are most worthy will be published in abstract. It is recognized that we cannot always anticipate our readers' interests and accordingly this advance list is published for the benefit of those who may not care to await our judgment and synopsis.

1,450,174—Nickeliferous Catalyzers and Process of Manufacturing Same. Albert Granichstadten and Emil Sittig, Vienna, Austria.

1,450,289—Apparatus for Entraining and Removing Fines From Conical Mills. Harry W. Hardinge, New York, N. Y.

1,450,290—Oversize Return for Mills. Harry W. Hardinge, New York, N. Y.

1,450,338—Apparatus for Producing Gaseous Fuel. Max Sklovsky, Moline, Ill., assignor to Deere & Co., Moline, Ill.

1,450,377—Method of Drying Colloids. George Perkins Lunt, New York, N. Y.

1,450,462—Method of Acidizing Rubber Waste. Richard A. Terhune, Fairhaven, Mass., assignor, by mesne assignments, to Conrad Gascholt, Carona, N. Y.

1,450,463—Sulphurized Compound of Phenols. Alfred Thauss, Dentz, near Cologne, and Alfred Günther, Cologne, Germany, assignors to Farbenfabriken vorm. Friedr. Bayer & Co.

1,450,464—Crystal Formation. Elihu Thomson, Swampscott, Mass., assignor to General Electric Co.

1,450,467—Silicate Cement. Hermann, Weyland, Elberfeld, Germany, assignor to Farbenfabriken vorm. Friedr. Bayer & Co.

1,450,493—Ketone Body and Process of Making Same. Carleton Ellis and Alfred A. Wells, Montclair, N. J., assignors, by mesne assignments, to Seth B. Hunt, trustee, Mount Kisco, N. Y.

1,450,507—Method of Recovering Vanadium From Its Ores. Philip Alexander MacKay, London, England.

1,450,545—Apparatus for Separating Liquids of Different Densities. Oscar E. Hans, Bartlesville, Okla.

1,450,562—Process for the Treatment of Gases From Gas Producers. Olivier Piette, Brussels, Belgium.

1,450,569—Apparatus for Producing Ketones. Robert R. Williams, Chicago, Ill., and Herbert L. J. Haller, Cincinnati, Ohio, assignors, by mesne assignments, to Seth B. Hunt, trustee, Mount Kisco, N. Y.

1,450,617—Process of Purifying Mineral Oils. James Smith, Glasgow, Scotland.

1,450,661—Apparatus for the Manufacture of Sulphuric Anhydride. Paul Audianne, Paris, France, assignor to Etablissement Kuhlmann, Paris.

1,450,675—Process of Separating Isomeric Trinitrotoluenes. Charles M. Stine, Wilmington, Del., assignor to E. I. du Pont de Nemours & Co., Wilmington, Del.

1,450,677—Sulphur Burner. Horace G. Chickering., Wilmington, Del., assignor to E. I. du Pont de Nemours & Co., Wilmington, Del.

1,450,678—Process of Producing Phthalimids. Harry D. Gibbs, Penns Grove, N. J., assignor to E. I. du Pont de Nemours & Co.

1,450,685—Bituminous Emulsion and Process of Making Same. Lester Kirschbraun, Chicago, Ill.

1,450,688—Paint. John T. Lawrence, Newark, N. J.

1,450,692—Printing Ink. William J. McElroy, New York, and John Clarke, Manhasset, North Hempstead, N. Y., assignors, by mesne assignments, to Alchemic Gold Co., Inc.

1,450,704—Production of Zinc Oxide. James A. Singmaster and Frank G. Breyer, Palmerton, Pa., assignors to New Jersey Zinc Co., New York.

1,450,712—Process of Making Prepared Roofing. Walter H. Cady, Boston, Mass.

1,450,714-15-16—Cellulose-Ether Solvent and Composition. Stewart J. Carroll, Rochester, N. Y., assignor to Eastman Kodak Co.

1,450,856—Non-Conducting Material. Robert Illemann, Glasgow, Scotland.

1,450,865—Water-Soluble Product and Process of Making the Same. Joseph Pelc, Cicero, Ill.

1,450,888—Coking of Coal. Stewart Roy Illingworth, Radyr, Glamorgan, Wales, assignor to Illingworth Carbonization, Co., Ltd., Manchester, England.

1,450,912—Method of Making Anhydrous Magnesium Chloride. Paul Cathringer and William R. Collings, Midland, Mich., assignors to the Dow Chemical Co., Midland, Mich.

1,450,926—Composition of Matter for Silverplating Metals. Lindolph Minar Sherow, Ossining, N. Y.

1,450,951—Wet-Filter Screen. Lucien Charles Cruyt, London, England, assignor to Heenan & Froude, Ltd., Worcester, England.

1,450,975—Process for the Manufacture of Borax and Boric Acid. Andrew Kelly, London, England, assignor to Borax Consolidated, Ltd., London, England.

1,450,982—Process for Removing Destructive Substances From Non-Aqueous Media. Melville J. Marshall and George S. Shaw, Shawinigan Falls, Canada, assignors to Shawinigan Laboratories, Ltd., Montreal, Que., Canada.

1,450,983—Manufacture of Aldehyde-Ammonia. Howard W. Matheson, Montreal, Canada, assignor to Shawinigan Laboratories, Ltd., Montreal.

1,450,984—Process of Making Condensation Products of Aliphatic Aldehydes. Howard W. Matheson, Montreal, Canada, assignor to Canadian Electro Products Co., Ltd., Montreal.

1,450,985—Process of Regenerating Beds of Exchange Silicates. Joseph M. Maxwell, Wichita, Kan.

1,450,990—Process of Making 2-Naphthol 3-Carboxylic Acid. Edmund C. Shorey, Washington, D. C.

1,450,992—Crystallizer. Truman E. Stevens, Omaha, Neb., assignor to Potash Reduction Co., Hoffland, Neb.

1,451,004—Method of Separating Zircon From Undesired Substances. Louis E. Barton and Charles J. Kinzie, Niagara Falls, N. Y., assignors to the Titanium Alloy Manufacturing Co., Inc., Niagara Falls, N. Y.

1,451,052—Treatment of Hydrocarbons. Heliodor Rostin, Vallo, Norway.

1,451,092—Cumaron Paint. Carleton Ellis, Montclair, N. J., assignor to Ellis-Foster Co.

1,451,113—Process of Producing Catalytic Material. George A. Richter, Berlin, N. H., assignor to Brown Co., Berlin, N. H.

1,451,125—Process for the Production of Paper Pulp and the Like. Bertrand S. Summers, Port Huron, Mich.

1,451,129—Method of and Apparatus for Oil Distillation. John W. Van Dyke, Philadelphia, Pa., assignor to the Atlantic Refining Co., Philadelphia, Pa.

1,451,135—Food Product and Process of Production. Albert W. Wright and Elisabeth H. Wright, San Francisco, Calif.

1,451,190—Gas Condenser. Frederick E. Voorhies, Tulsa, Okla.

1,451,313—Art of Reducing Inflammability of Materials. Arthur Arent, Des Moines, Iowa, assignor to Arthur Arent Laboratories, Inc., Des Moines, Iowa.

1,451,330-31—Manufacture of Cellulose Derivatives. Henry Dreyfus, London, England.

1,451,367—Process of Treating Shale. Stephan Marko, Chicago, Ill.

1,451,399—Process of Producing Halogen Acids. Frank S. Low, Niagara Falls, N. Y., assignor to Weaver Co., Madison, Wis.

1,451,472—Pulverizing Mill. Ralph E. H. Pomeroy, Canton, Ohio.

1,451,485—Composition for Fireproofing and Other Purposes and Process of Preparing Same. William Levis Wootton, Brooklyn, N. Y.

1,451,489—Process for the Manufacture of Azoxy, Azo, Hydrazo and Amino Compounds. Oliver W. Brown and Clyde O. Henke, Bloomington, Ind.

1,451,522—Mechanism for the Recovery of Paper Stock. Burke M. Baxter, Cleveland, Ohio, assignor to American Reduction Co., Pittsburgh, Pa.

1,451,540—Manufacture of Self-Hardening Refractory Articles. William A. France, Philadelphia, Pa.

1,451,543—Electroplating With Zinc. Joseph Haas, Jr., Muncie, Ind., assignor to the Roessler & Hasslacher Chemical Co., New York, N. Y.

1,451,574—Oil-Refining Device. Charles Fred Hillman, Wichita Falls, Tex.

1,451,575—Oil-Shale Retort. George Edward Holmes, Salt Lake City, Utah.

1,451,589—Drier. Walter M. Schwartz and Elwood B. Ayres, Philadelphia, Pa., assignors to Proctor & Schwartz, Inc., Philadelphia, Pa.

1,451,603—Still. Henry C. P. Weber, Edgewood Park, Pa., assignor to Westinghouse Electric & Manufacturing Co.

1,451,666—Production of Alpha-Naphthylamine. Stuart P. Miller, Philadelphia, Pa., assignor to The Barrett Co.

1,451,670—Antiseptic and Insecticidade Soap or Composition. Robert MacPherson, Worthing, and William E. Heys, Bushel, England.

For complete specifications of any U. S. patent remit 10c. to the Commissioner of Patents, Washington, D. C.

the oxides almost as fast as they are formed. For the higher alkylene oxides means for heating should be provided such as a jacket for steam or hot oil. It is important, in order to get the best yields, to remove the oxides as fast as formed, since other products are formed by the action of caustic alkali or lime on the oxides in the presence of water or glycol.

Oxides prepared in this manner may be used in various ways in the arts, as for example as blending or mixing solvents to cause liquids normally immiscible to mix. For example, gasoline or kerosene does not mix well with ethyl alcohol, but addition of oxides prepared from olefines of cracked petroleum brings about the desired miscibility. (1,446,872. Benjamin T. Brooks, of Bayside, N. Y., assignor to Chadeloid Chemical Co. Feb. 27, 1923.)

Manufacture of Potassium Sulphate—Camille Horst, of Wittelsheim, France, has obtained a patent for a process of treating gypsum with carbon dioxide suspended in an aqueous solution of caustic potash to obtain a saturated solution of potassium sulphate. The reaction is as follows:

$$CaSO_4 + 2KOH + CO_2 = CaCO_3 + K_2SO_4 + H_2O$$

This reaction is thought to take place in two steps; first forming a carbonate of potash, as follows:

$$2KOH + CO_2 = K_2CO_3 + H_2O$$

and the second reaction:

$$CaSO_4 + K_2CO_3 = CaCO_3 + K_2SO_4$$

This process is based upon the difference of solubility between the carbonate and the sulphate of calcium, the carbonate being practically insoluble and the sulphate very little. The reaction is said to be quantitative and the byproduct—namely, calcium carbonate—is a product capable of industrial application. (1,446,185. Feb. 20, 1923.)

Treatment of Raw Rubber and Like Plastic Substances—A patent has been issued to the estate of S. C. Davidson, of Belfast, Ireland, for an improved method in treating raw rubber and similar substances. Raw rubber freshly coagulated from the latex is placed in a machine consisting of three rolls, which act in the same manner as the usual massaging or kneading machines used for this purpose. The final traces of water may be removed in this process by rolling and elongating under pressure the mass to be treated. While still under full pressure the rolled mass is enveloped. The material used is substantially inextensible under any ordinary tensile stress and is at the same time readily suitable for the absorption of the moisture exuding from the mass. The wrapped material is then hung in an airy room, well ventilated, where after a few days its tendency to contract is entirely overcome. At this stage the final traces of moisture ooze out and evaporate from the wrapping. For the wrapping material a heavy strongly woven cotton tape or similar webbing is employed. An automatically attached string buckle is used in fastening the webbing to the roll. (1,446,737. Feb. 27, 1923.)

Acetyl Cellulose From Bleached Sulphite Paper Pulp—W. J. Stevenson of Charing Cross, England, has obtained a patent for improvement in methods of manufacturing acetyl cellulose. Instead of employing bleached cotton wool, as has been the case in the past, he makes use of bleached sulphite paper pulp, which he claims gives greater stability, better control, longer life and easier impregnation with dyes and colors. Glacial acetic acid and acetic anhydride are used in carrying out the reaction. As catalyzers zinc chloride, nitric acid or dimethyl sulphate are employed. These materials, thoroughly mixed, are allowed to stand for 7 to 8 hours at a temperature of 60 to 70 deg. C., submerged in an excess of water. The precipitate is washed and dried at a temperature of 100 to 120 deg. C. (1,441,541. Jan. 9, 1923.)

Oxy-derivatives of Anthraquinone—Oxy-derivatives of anthraquinone, especially alizarin, may be manufactured by the following method, patented by A. H. Davies of Carlisle, England. He has assigned the patent to Scottish Dyes, Ltd., of same address. If mono- or 2-chlor anthraquinone is autoclaved for 24 hours at 170 deg. C. in a caustic alkali solution in the presence of such an oxidizing agent as a chlorate or nitrate, the chlorine atoms are replaced by hydroxyl groups. Moreover, a further hydroxyl group is introduced into the molecule.

From 2-chlor anthraquinone, by using caustic soda as the alkali and sodium chlorate as oxidizing agent, alizarin is obtained. The dye is extracted by diluting and acidifying the filtered solution. (1,446,163. Feb. 20, 1923.)

Recovery of Products From Tinned-Iron Waste—A patent has been granted H. V. Welch and W. A. Sheek of Los Angeles and Long Beach, Calif., for the recovery of tin, lead and iron from scrap. The scrap is sheared or divided into fragments of suitable size and fed into a cupola furnace of special construction which allows more time than does the usual type of furnace for melting down. Carbonaceous material, also lime, may be fed into the furnace along with the material to be melted down. Air is supplied through tuyeres at the bottom of the furnace, as in usual practice. Gas may also be forced in at this point and burned with the carbonaceous material in order to obtain the reducing atmosphere desired in the furnace. To aid in the volatilization of the tin and lead which may be present, halogen gases or halide in solid form may be utilized. If in gaseous form, they are fed in at the tuyeres; if in solid form, they are fed in with the charge. The amount of gas required is at least 5 lb. for every 2 lb. of tin known to be present in the charge. Tin or lead which are volatilized in the process are recovered by a Cottrell or similar fume separator. The temperature employed for volatilization is as near the melting point of iron as is possible. (1,446,953. Feb. 27, 1923.)

Method of Treating Fibrous Material—A patent has been granted to Eduard Dyckerhoff of Hanover, Germany, for waterproofing material to make it useful for building or insulating purposes. The treatment consists in heating the material on trays or in drying drums to a temperature of approximately 120 deg. C. This process renders the material water-resisting and non-hygroscopic. Subdivided wood thus treated is suitable for filler material in the manufacture of cements, mortars, etc. (1,446,888. Feb. 27, 1923.)

Treatment of Products Made With Cellulose Derivatives—L. G. Richardson of Nottingham, England, has assigned to the American Cellulose & Chemical Manufacturing Co., Ltd., of New York, the following patent for treating of cellulose products. The saponification of cellulose acetate products (lower than tri-acetate) is carried out in a bath to which sodium acetate has been added in addition to the straight caustic solution usually employed. This addition intensifies and controls the partial saponification and enables level dyeing to be more easily obtained. A small amount of caustic soda is maintained in the bath at all times. As fast as this NaOH is exhausted the supply is replenished and in this way the bath may be maintained in active condition over an indefinite period. It is essential that the amount of free caustic in the bath at any time be maintained as low as possible and that the temperature at which the operation is carried out be held between 50 and 75 deg. C. (1,442,631. Jan. 16, 1923.)

Lubricants From Tar—This patent covers a process of obtaining lubricants from a low-temperature tar. The process starts with a low-temperature tar, rich in non-saturated compounds, whose constituent parts distill between 260 to 320 deg. C., and preferably between 275 and 300 deg. C., at atmospheric pressure, after being first freed of paraffin and phenols.

Polymerization is then effected together with some such means as blowing air through it while holding at some predetermined temperature or subjecting it to high tension electrical oscillations, while in an atmosphere of hydrogen and at a proper temperature. The lower the temperature during polymerization the better the properties of the final product. The viscosity can be increased at will according to the degree to which the polymerization medium is allowed to act. Viscosities up to 30 deg. Engler at 50 deg. C. are obtained. The final product is light colored. (1,450,026. Egen Eichwald and Hans E. R. Vogel, Hamburg, Germany. March 27, 1923.)

Men in the Profession

CARL L. ALSBERG, director, Food Research Institute, Stanford University, spoke before the Washington Chemical Society, April 12, on "Agriculture and Fuel Supply as the Limiting Factors in the Food Supply of the World."

C. L. BACHELDER has left the employ of the Consolidated Water Power & Paper Co. and is now with the Interlake Pulp & Paper Co., Appleton, Wis.

Dr. ARTHUR W. BROWNE, of the chemistry department of Cornell University, recently addressed the Syracuse Section of the American Chemical Society on "An Organic Compound of Sulphur."

C. B. CARPENTER, ARTHUR W. THOMAS and J. ENRIQUE ZANETTI have been raised from the rank of assistant professors to that of associate professors of chemistry at Columbia University.

Dr. ARTHUR B. CLARK, of the National Aniline & Chemical Co., of Buffalo, N. Y., read an interesting paper on Photomicrographic Records at a recent meeting of the Miscroscopical Section of the Buffalo Society of Natural Sciences.

C. R. DELONG, chief of the chemical section of the Tariff Commission, spoke before the American Drug Manufacturers Association, New York, April 17 on "The Tariff of 1922, and the Chemical Industry." Mr. DeLong made a comparison of some of the rates of duty on medicinal chemicals and drugs in the new tariff and previous tariffs, and explained the operations of the flexible tariff section of the act.

Dr. F. G. DONNAN, professor of chemistry, University College, London, and Dr. JAMES C. IRVINE, principal and vice-chancellor, University of St. Andrews, talked of their recent researches in chemistry, April 17, 1923, at a joint meeting of the Philosophical Society of Washington, the Chemical Society of Washington and the Washington Academy of Sciences. These gentlemen, accompanied by Prof. A. F. Holleman of Amsterdam and Prof. Giuseppe Bruni of Milan, Italy, spent practically the entire week of April 16 in Washington, visiting chemical laboratories of the government and attending special luncheons, dinners and other forms of social activities.

L. H. DUSCHAK, secretary of the California Section of the American Chemical Society, presented a paper on the chemical engineer's part in the fighting of mine fires, at the Mine Safety Conference recently held at Globe, Ariz.

Dr. E. C. FRANKLIN, president of the American Chemical Society, spoke before the New Jersey Chemical Society on April 13 and the Syracuse Section of the A.C.S. on April 17. His subject at both meetings was "Ammonia System of Compounds."

R. C. HARTONG, formerly chemist at the plant of the Goodyear Tire & Rubber Co., Akron, Ohio, has been elected president and treasurer of the Chemitex Products Co., recently organized by local interests to establish a plant at Mogadore, near Akron.

Dr. ELLWOOD HENDRICK, consulting editor of *Chem. & Met.*, spoke before the following local sections of the American Chemical Society: Lansing, Mich., April 18; Chicago, Ill., April 20; Purdue, Lafayette, Ind., April 21, and at Cincinnati, April 23. His subject at Chicago was: "Obligations of Physical Science."

RAYMOND HERTWIG, assistant chemist, San Francisco station, Bureau of Chemistry, has been assigned to the food-control laboratory of the bureau in Washington for 2 months.

ARTHUR J. HOSKINS, research assistant professor of mining, has been appointed the acting head of the department of mining, University of Illinois, to fill the vacancy caused by the sudden death of Dr. H. H. Stoek, the founder of the department of mining at Illinois. Professor Hoskins has had 33 years experience in mining and metallurgy.

J. M. MALLORY, general industrial agent of the Central of Georgia R.R., and R. T. STULL, formerly the ceramic engineer in charge of the Columbus Experiment Station of the Bureau of Mines and who is now doing special work on Georgia clays, conferred recently with chemists in Washington on the general progress of the work.

Dr. ROYAL A. MEEKER, state commissioner of labor and industry, Pennsylvania, has resigned as chief of the scientific division, international labor organization of the League of Nations secretariat, Geneva, effective March 31.

Dr. E. S. MERRIAM has resigned as chief chemist of the Safe Cabinet Co. in order to resume his consulting work in connection with natural gas, casinghead gasoline and carbon black, at Marietta, Ohio.

Dr. R. B. MOORE, chief chemist of the Bureau of Mines, will discuss hafnium and other rare and suspected elements when he addresses the New York Section of the American Chemical Society on June 8.

EDMUND O'NEILL, for 45 years a member of the faculty of the University of California, recently announced his resignation as professor of inorganic chemistry to take effect after this semester. Professor O'Neill's personality has endeared him to all with whom he has come in contact, and he relinquishes active work to the regret of his colleagues and associates. He has been granted sabbatical leave by the university authorities and will travel in the Orient during the summer.

GEORGE H. RASCH, general manager, byproducts department, Morris & Co., has resigned to become president and general director of the United Serum Co., with plants at Kansas City, Kan., Wichita, Kan., and East St. Louis, Ill.

P. O. ROSEWARN, of the Canadian Department of Mines, inspected the Bureau of Mines Cryogenic Laboratory in Washington recently.

Dr. E. W. SCHWARTZE, pharmacologist in charge of the pharmacological laboratory, Bureau of Chemistry, recently lectured before a class of graduate physicians from the Veterans' Bureau.

Dr. WALTER O. SNELLING, director of research for the Trojan Powder Co., gave an address on the subject of synthetic chemicals, particularly relating to new developments, before the members of the Allentown Radio Club, Allentown, Pa., March 26.

Prof. JULIUS STIEGLITZ, of the University of Chicago, is to be the recipient of the J. Willard Gibbs medal, awarded annually by the Chicago Section of the American Chemical Society, for his researches in organic chemistry. The medal will be presented in May.

Dr. ALBERT P. SY, of the department of chemistry of the University of Buffalo, spoke before the alumni club of the university April 7, on "Food and Food Values."

Obituary

ELMER A. COTTEN, refinery superintendent of the Atlas plant of the Standard Oil Co., at Buffalo, N. Y., died April 11. Mr. Cotten had been 40 years with the Standard Oil Co. and had been refinery superintendent more than a score of years.

J. EMIL FRANK, owner and publisher of the *Textile Colorist*, died March 1 of pneumonia at his home in New York. The journal was founded by his father, Dr. Morris Frank, in 1879 and Mr. Frank had been connected with it throughout his life.

WILHELM KONRAD RÖNTGEN, who was born in 1845, died recently in Munich, Germany, at the age of 78. A German physicist, born at Lennep, in Rhenish Prussia, he received his doctor's degree in 1869 at the University of Zurich, where he studied under Kundt. He was afterward professor at Hohenheim, Strassburg, and Giessen, and in 1885 he became professor at the University of Würzberg. In 1899 he was appointed professor of experimental physics at the University of Munich. In November, 1895, before the Physico-Medical Society of Würzberg he read a paper on his discovery of the rays which bear his name. For this discovery he received many honors, including the Rumford medal of the Royal Society of London and the Barnard medal of Columbia University, awarded in 1900 for the greatest discovery in science during the preceding 5 years. In 1901 he was awarded the Nobel prize for physics.

The Week in
Industry and Trade
Current News and Market Developments

April 23, 1923

CHEMICAL & METALLURGICAL ENGINEERING

Tenth Avenue at 36th Street, New York

H. C. PARMELEE, *Editor*

News Section

Washington News	739
Trade Brevities	744
Construction and Operation	750
Industrial Developments	750
New Companies	751
Industrial Notes	752
Coming Meetings and Events	752

Market Section

Chemicals	743
Coal-Tar Products	745
Oils and Fats	746
Miscellaneous Products	746
Imports at the Port of New York	747
Current Prices in the New York Chemical Market	748

The Summary of the Week

Census reports show that domestic production of organic chemicals increased 177 per cent in the seven-year period from 1914 to 1921.

Local importers' protest against levying duty on arrivals of cresol from foreign markets overruled by Treasury decision.

Active trading in salicylic acid cleans up surplus holdings and causes the market to close in a strong position.

Copper sulphate sold down in price with supplies of imported grades pressed for sale. Domestic makes are not following the lead of the imported.

Tartaric acid was advanced one cent per pound due to continued good demand and lessened foreign competition.

March cottonseed products report indicates small supply of cottonseed oil for remainder of crop year.

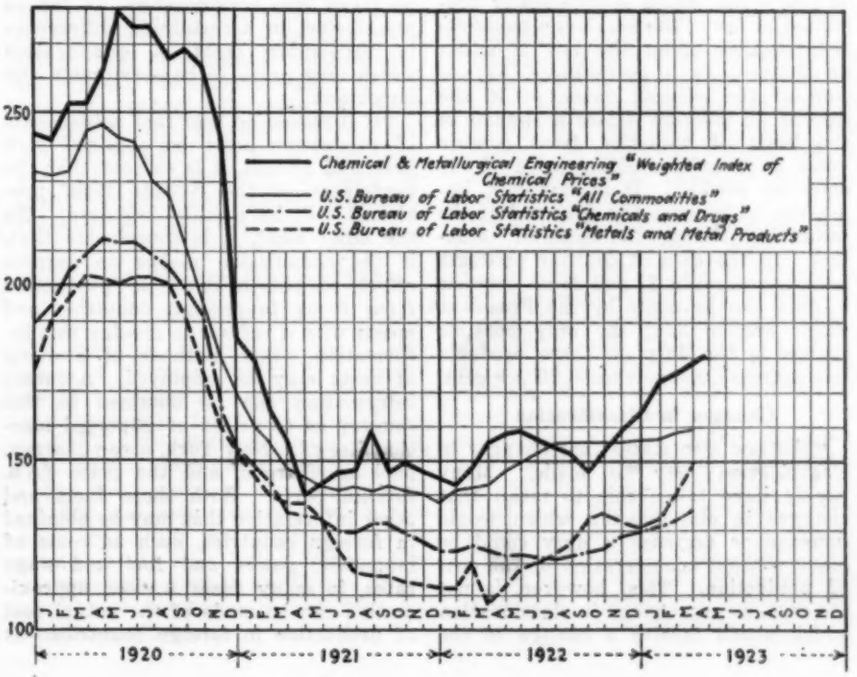
The Upward Trend of Chemical Prices

PROBABLY there is no more convincing evidence of the return of business confidence than is to be seen in the upward surge of commodity prices. Since the first of the year the general level of wholesale prices has shown a consistent advance, but this movement has been most marked in the case of chemicals and a few related materials.

Measuring this trend of prices in terms of the index numbers of the Bureau of Labor Statistics, it will be observed that the "all commodities" index has risen from 142 in March, 1922, to 159 in March, 1923—a gain of 12 per cent. The chemical group stood at 131 in January, 1923, and increased to 132 in February and to 135 in March. Metal prices, in terms of the same index numbers, rose from 109 in March, 1922, to 149 in March, 1923. This is an increase of 36.4 per cent and the largest gain for any group.

Chem. & Met.'s weighted index of chemical prices, based on a somewhat different series of commodities, shows an even more striking improvement. Emerging from the slump of October, 1922, when this stood at 147, it has since climbed steadily until at the present time it is at a level of about 180—i.e., 80 per cent above the pre-war prices of 1913-14.

For the benefit of new readers it might be explained that *Chem. & Met.'s* index is a weekly compilation based on the average wholesale prices in New York for twenty-five representative chemicals. In order that these commodities might be considered according to their relative importance, a "weighting" factor was obtained by multiplying the production plus imports of each chemical during the last census year by its average price for the fiscal year 1913-14. After these factors had been reduced to a percentage basis the procedure is repeated using the weekly quotations for each commodity. The index number thus obtained gives a clear and accurate idea of the average fluctuations in the chemical industry and makes it possible to compare these fluctuations with those taking place in other industries.



Technical Societies and Trade Associations

News of the Week

Current Events Legislative Progress

Methods for Operating Flexible Provisions of Tariff Law

How Tariff Commission Will Obtain Production Costs—Individual Manufacturers' Costs Not to Be Made Public—Applications for Tariff Changes Held Confidential Until Investigations Are Justified

IN AN address before a meeting of the American Drug Manufacturers' Association at New York, last Wednesday night, C. R. DeLong, chief of the Chemical Division, United States Tariff Commission, discussed the tariff of 1922 with especial reference to its bearing on the chemical industry.

Mr. DeLong gave a very instructive exposition of the flexible features of the tariff, in which he said:

Flexible Tariff Provisions

"The flexible provisions of the present tariff act are an innovation in tariff law, and therefore I assume that you are more or less interested in the plans of the commission for investigations under these sections. They are found in sections 315, 316 and 317 of Title III of the law. It is apparent from the applications which the commission has received that there is considerable misapprehension as to what can be accomplished under these provisions. Many of the requests deal with questions of classification, which are clearly a function of the Treasury Department; others ask that commodities be changed from the dutiable list to the free list or *vice versa*, which is specifically prohibited by law. The maximum modification possible under the law is either an increase or a decrease of 50 per cent of the existing rates, or in the case of ad valorem duties a change in the basis of valuation from foreign value to American selling price of the domestic product. It is, however, impossible to increase the duty and at the same time change the basis of valuation. In the case of coal-tar products under paragraphs 27 and 28 no increase in duty can be made by the President under section 315; the only possible change in the duty on these products is a decrease, not to exceed 50 per cent.

Changes in Classification

"The law also states that changes in classification may be made. Many people have taken this to mean that changes in classification which would increase or decrease a duty could be made without consideration of the cost of production. This, however, is not the case, as any change in classification which would involve a change in the rate of duty must be warranted by the facts relative to costs of production, as set forth in the law.

"An important question, and one on which the workability of section 315 may depend, is whether or not actual and complete costs of production must be obtained both here and in the principal competing countries before changes may be made in rates of duty in pursuance of the flexible provisions of the tariff act. In other words, is the term 'cost of production' as used in the act limited to the ordinary understanding of what constitutes costs? It is readily conceivable that in certain cases considerable difficulty may be encountered in ascertaining foreign costs of production, and the question naturally arises as to whether or not section 315 can be effective in such cases.

Basis for Changes in Duty

"Wherever changes in rates of duty are referred to, it is stated that these changes shall be such that they will equalize the differences in costs of production. Subdivision (*c*), however, enumerates certain elements which may be taken into consideration, as far as practicable, in ascertaining differences in production costs, a qualification which may prove to be serviceable and important.

"If it should be held that actual costs of production must be obtained both here and abroad, it is evident that the usefulness of the flexible tariff provisions will be greatly impaired. On the other hand, it is conceivable that, if the commission makes an earnest effort to obtain costs of production from firms in foreign countries and meets with a refusal to divulge this information, other methods of arriving at costs may be employed. Accurate information can be obtained in this country as to prices of imported merchandise c.i.f. New York, ocean charges, packing charges, and the price f.o.b. foreign ports. With these facts and other information that may be obtained in foreign countries, such as costs of materials, power and fuel and wage rates, in many cases a close approximation can be made of the actual cost of production in foreign countries. It is not unreasonable to expect that such information would satisfy the law so far as costs of production are concerned.

Method of Obtaining Costs

"You may be interested to know the methods of procedure of the commission in obtaining costs of production here and abroad. At the present time all domestic firms engaged in the manufacture of the chemicals for which the commission has ordered investigations have been requested to submit their costs to the commission in accordance with a definite cost form. The commission is not requesting these firms to fill in cost schedules, but is using cost forms as an indication of the detail in which it is desired that costs be submitted. The costs may be submitted on the individual company's forms.

"A question that is naturally foremost in each manufacturer's mind is whether or not the costs of production of individual manufacturers are to be made public or held confidential. The commission has decided that costs of individual manufacturers will be held strictly confidential and for the exclusive use of the commission. Costs will be published or revealed only in the form of averages or so as not to reveal the operations of individual firms. The commission has also taken the same attitude in regard to costs that may be obtained from foreign manufacturers.

Publicity as to Applications

"The commission has adopted the policy of not making public information as to whether or not applications have

Calendar

The following important technical meetings are scheduled for the immediate future:

AMERICAN WELDING SOCIETY
New York, April 24-27

AMERICAN OIL CHEMISTS' SOCIETY
Hot Springs, Ark., April 30-May 1

AMERICAN FOUNDRYMEN'S ASSOCIATION
Cleveland, O., April 30-May 3

INTERSTATE COTTON SEED CRUSHERS ASSN.
Hot Springs, Ark., May 2-5

AMERICAN ELECTROCHEMICAL SOCIETY
New York City, May 3-5

AMERICAN CHEMICAL SOCIETY
Regular meeting, New York, May 4

AMERICAN ZINC INSTITUTE
St. Louis, May 7-8

AMERICAN ASSN. OF ENGINEERS
Norfolk, May 7-9

AMER. SOCIETY MECHANICAL ENGRS.
Montreal, May 28-31

CANADIAN INSTITUTE OF CHEMISTRY
Toronto, May 29-31

SOCIETY OF CHEMICAL INDUSTRY
Canadian Section
Toronto, May 29-31

been filed on various commodities until it has been decided whether investigations are justified. It is, of course, impossible to prevent applicants from giving such information to the public, and the information which has appeared prior to the announcement of an investigation by the commission has come from this source. The commission is of the opinion that publicity in connection with each complaint as filed would tend to keep domestic manufacturers and other interested parties in an unsettled condition. Since all complaints may not warrant an investigation or may not for various reasons be investigated, it seems that it would be an unwise policy to keep business in a constant state of turmoil by giving publicity to each application as filed. The commission, however, assures you that following the announcement of an investigation, ample opportunity will be given to all parties to submit evidence and testimony, and to be heard at a public hearing.

"It is apparent that considerable stress has been placed by interested parties on the nature of applications—that is, whether they are for an increase or a decrease in duty, and also as to the names of the applicants. Although the commission has decided to make such information public, when an investigation is ordered, undue weight should not be given to these facts. The law clearly states that any changes resulting from investigations shall equalize the difference in cost of production in this country and in the principal competing foreign country. It is, therefore, clear that if an application is for an increase of duty and the facts show that a decrease in the rate is the only change that will equalize this difference in costs, such a decrease can be made. The same holds true for converse conditions. The facts should appear to warrant the desired change before an application for an investigation is filed. Otherwise, a change may result which would be adverse to the applicant's interest.

"That this situation is not fully understood is shown by the fact that since the commission has ordered an investigation of certain chemicals, requests have been made for a change contrary to that of the application which resulted in an investigation being ordered by the commission. It should be clearly understood that a finding by the commission may be made either way, depending upon facts in the case, regardless of the nature of the application."

Washington News

Investigate Production Costs of Casein

F. W. McSparren, a chemist of the Chemical Section of the Tariff Commission, and Edwin Schoenrich, an accountant and linguist, sailed from New York April 14 for the Argentine, where they will conduct an investigation into costs of production of casein, regarding which American manufacturers of coated paper have applied for a reduction in duty under the flexible tariff law. Their schedule calls for a month in the South American republic.

Hankow Cables Show Advance in Wood Oil Prices

Prices of china wood oil have advanced materially in China. A cable quotation indicates that $316 U. S. gold per ton was being paid on April 16 at Hankow. This is an increase from $260 the latest preceding quotation. Even with the very high prices being offered, spot oil is very scarce. The difficulty of getting stocks to Hankow from the interior is given as the cause of the shortage.

Japan Hoarding Dyestuffs

The dullness which has characterized the dyestuff market in Japan recently was transformed into a period of speculative activity in which prices throughout the list rose sharply. The situation was precipitated, it is believed, by the realization that supplies were being quietly hoarded and the realization that the situation in the Ruhr would not be a temporary one.

Good Car Service for Movement of Fertilizers

Fertilizer manufacturers are particularly pleased with the car service which is being afforded them for the movement of this season's fertilizers. The railroads have made a special effort to co-operate with the manufacturers, and general satisfaction is expressed at the result. The performance of the railroads during this period in which fertilizers must be moved is the first general recognition which has been given of the necessity of handling fertilizers with an understanding of their seasonal application.

Higher Prices for German Potash in May

A material increase in the export price of German potash is expected May 1. The present prices applying to potash exports for the United States are: Chloride, $32; sulphate, $41.10; manure salt, $9.50; kainit, $6.50.

The total German export of potash in 1922 was approximately one million long tons. Of that amount, 25 per cent came to the United States. The pre-war movement to the United States alone was about one million tons annually.

February Chemical Exports Show Gain in Value

Substantial Increases as Compared With Figures for January and for February, 1922

A material increase in the value of chemicals and allied products exported in February is shown in comparison with the value of exports in January and in February of 1922. In February of this year the value of all chemicals and allied products exported, according to the returns to the Department of Commerce, was $9,321,365. The exports in January were $8,638,779. The value of exports in February, 1922, aggregated $7,665,272.

The value of coal-tar products exported in February was $986,545. This is an increase of more than $300,000 over the volume of exports in January and is more than $600,000 greater than those of February, 1922.

Sodas and sodium compounds were exported in February to the extent of $760,859. This is a slight decrease when compared with the value of exports in January and with those of February of 1922.

Pigments, paints and varnishes valued at $1,020,989 were exported in February of 1923, which represents an increase of more than $250,000 over February of 1922 and shows a continuance of the large volume of these exports maintained during January.

Exports of fertilizer and fertilizer materials augmented appreciably. The movement in February of 1923 was valued at $1,448,804. This is nearly half a million dollars greater than the value of exports in January. The movement of sulphate of ammonia increased from $549,108 in January to $797,041 in February.

The shipment of explosives abroad continues to pick up. The February total was 1,485,011 lb., which is more than half a million pounds greater than the January export movement of these commodities.

Exports of soaps contributed to the February increase, with the exports of laundry soap reaching the high total of 5,739,720 lb., and those of toilet soap attaining an aggregate of 842,971 lb. Other soaps to the extent of 2,017,531 lb. were exported.

Other chemical products exported during February which show an increase over the January movement, with February totals, are as follows: Benzol, 5,637,621 lb; crude tar, 14,097 bbl.; other crude distillates, 36,934,756 lb.; coal tar, colors, dyes and stains, 1,338,395 lb.; acetic acid, 102,670 lb.; wood and denatured alcohol, 190,289 gal.; other alcohol, 33,699 gal.; ammonia and ammonium compounds, 1,511,518 lb.; copper sulphate, 636,448 lb.; glycerin, 87,760 lb.; cyanide of soda, 210,780 lb.; borax, 5,081,352 lb.; silicate of soda, 1,770,500 lb.; sal soda, 878,670 lb.; red lead, 576,062 lb.; white and sublimed lead, 614,884 lb.; prepared fertilizer mixture, 4,682 tons.

Organic Chemical Production Increases 177 Per Cent in 7-Year Period

Domestic Output Lower Than Abnormal Production of 1919, but Shows Healthy Expansion Over 1914 Totals

REPORTS made to the Bureau of the Census by establishments manufacturing organic chemicals that are not included in special chemical groups (listed below) show a production aggregating in value $45,476,600 in 1921, as compared with $72,141,542 in 1919 and $16,377,955 in 1914—a decrease of 37 per cent as compared with 1919, but an increase of 177 per cent for the 7-year period 1921-1914.

	1921	1919	1914
Alcohols:			
Amyl alcohol, gal.	107,200	241,254	(2)
Glycerin (glycerol):			
Crude, lb.	21,856,000	21,402,735	16,568,920
Refined, lb.	68,843,700	69,464,298	60,944,799
Alcohols other than amyl and ethyl, but including absolute ethyl alcohol produced in chemical establishments	$804,800	$553,234	(2)
Aldehydes:			
Formaldehyde, lb.	9,682,700	25,006,815	.....
Vanillin, lb.	191,700	134,687	120,619
Other aldehydes	$484,000	$1,794,268	(2)
Amines and amids, lb.	1,374,200	(2)	(2)
Carbon bisulphide, lb.	22,741,000	15,469,567	(2)
Hydrocarbons, including acetylene	$8,289,800	$8,060,541	(2)
Other carbon compounds, calcium carbide, decolorizing carbon, carbon electrodes, etc.	$13,851,000	$20,301,657	(2)
Esters:			
Amyl acetate, gal.	56,300	125,692	.....
Ethyl acetate, gal.	906,600	770,739	(2)
Ethyl nitrite, lb.	59,400	43,153	(2)
Other esters	$106,900	$1,007,794	.....
Halogen compounds:			
Chloroform, lb.	944,300	1,677,641	1,333,954
Ethyl chloride, lb.	208,300	248,103	(2)
Other halogen compounds and carbon tetrachloride, chloral hydrate, ethyl bromide, iodoform, etc.	$599,300	$1,057,896	(2)
Ethers: Ethyl (sulphuric) and other, lb.	3,763,300	4,898,033	.....
Ketones:			
Acetone, lb.	4,380,100	6,045,914	10,425,817
Other ketones, lb.	1,218,600	1,531,808	(2)
Other organic chemicals	$2,135,300	$1,409,158	(2)
Unclassified organic chemicals	$1,245,700	$4,138,359	(2)

(1) Not including (except as noted) ethyl or grain alcohol, the products of distilleries, or methanol (wood alcohol), for which see "Wood Distillation."
(2) Figures not available.

The special chemical groups for which separate reports are being issued are as follows: (1) Acids; (2) nitrogen compounds; (3) sodium compounds; (4) potash and potassium compounds; (5) alums, aluminum, and compounds; (6) bleaching compounds; (7) coal-tar chemicals; (2) plastics; and (9) compressed and liquefied gases.

The principal organic chemicals here included are the following:

Refined glycerin, with a production for sale in 1921 of 59,861,400 lb., valued at $9,514,300, a decrease on a quantity basis of 11 per cent as compared with 1919, but a slight increase (less than 1 per cent) as compared with 1914.

Vanillin, with a production in 1921 of 191,700 lb., valued at $1,496,900, an increase on a quantity basis of 42 per cent over 1919, and of 59 per cent over 1914.

Ethyl ether, with a production for sale in 1921 of 3,416,100 lb., valued at $920,700, a decrease of 17 per cent in quantity compared with 1919, but an increase of 61 per cent over 1914.

Carbon bisulphide, with a production for sale of 14,942,000 lb., valued at $795,900, an increase in quantity of 29 per cent compared with 1919.

Formaldehyde, with a production for sale of 6,088,700 lb., valued at $649,000, a decrease in quantity of 69 per cent as compared with 1919, and of 28 per cent as compared with 1914.

Acetone, with a production of 4,380,100 lb., valued at $441,700, a decrease of 27 per cent in quantity as compared with 1919, and of 58 per cent compared with 1914.

Chloroform, with a production of 944,300 lb., valued at $289,300, a decrease of 44 per cent in quantity as compared with 1919, and 29 per cent as compared with 1914.

Ethyl acetate, with a production of 410,800 gal., valued at $241,200, an increase in quantity of 16 per cent as compared with 1919.

The figures for 1921 are preliminary, and subject to such change and correction as may be found necessary from a further examination of the original reports.

The detailed statistics of production for 1921, 1919 and 1914, are given in the accompanying table.

Refractories Merger Looms

Negotiations for the purchase of American Refractories Co. by the General Refractories Co. have been concluded and it is said that the merging of the two companies now awaits only the formal approval of the stockholders of the two organizations.

By this purchase the General Refractories Co. increases its annual capacity to about 300,000,000 bricks, making it the second largest producer in the country. It has plants at Baltimore and at Danville and Joliet, Ill. The recent purchase will add particularly to the company's silica and magnesite brick capacity.

Chemical Salesmen Dine and Hold Business Meeting

A well-attended meeting of the Salesmen's Association of the American Chemical Industry was held last Wednesday evening at the Chemists' Club, New York City. Dinner was served at 7 o'clock. While the dinner was in progress songs were sung under the able leadership of F. E. Signer, D. F. Stewart and G. A. Bode. R. E. Dorland presided at the business meeting. Reports of progress were given by the committees on uniform sales contracts and return packages, as submitted by Messrs. Haynes and Tunison respectively. R. C. Anthony was appointed chairman of the entertainment committee for the next meeting, which will be held late in May or early in June and will be in the nature of an "outing." The following eight new members were admitted to the association: B. K. Hotchkiss, representing Hooker Electrochemical Co.; P. M. Dinkins, of the Kalbfleisch Corporation; H. G. Stephenson, of E. I. du Pont de Nemours & Co., Inc.; E. V. Finch, of the United States Alkali Export Association; John F. Martini, of Monsanto Chemical Works; Milton Louria of Maple Chemical Co.; Arthur J. Binder, of the Sherwin-Williams Co., and B. M. Van Clive, also from the Sherwin-Williams Co.

H. Seydel, of the Seydel Chemical Co., spoke briefly on the interdependence of the executive and sales branches of the industry. He was followed by Charles Wadsworth 3d, assistant editor of *Chem. & Met.*, who discussed problems of distribution. Mr. Wadsworth then introduced the principal speaker of the evening, Paul T. Cherington, of the J. Walter Thompson Co. Mr. Cherington delivered a very interesting and instructive address on the subject, "Problems Experienced in Marketing a Consumer Product."

Acid Accidents Must Stop

Tank cars carrying acids, more especially sulphuric, should not be subjected to pressures of over 30 lb. per sq.in. The tank car pressure committee of the Manufacturing Chemists' Association reported to the executive committee of that association at its New York meeting on April 18 that in many cases pressures as high as 80 lb. per sq.in. are being used. Serious damage to apparatus as well as personal injury has resulted due to accidents caused by neglect of heeding the 30 lb. per sq.in. pressure recommendation. A campaign of education to correct this malpractice among producers and consumers is to be carried on by the association.

The executive committee at the same time appointed two members to establish standard specifications for earthenware apparatus.

The annual meeting of the association is to be held at the Whitehall Club, New York, on June 6.

Foreign Chemists Amazed at Development Here

Such an ambitious program of meetings, visits and social affairs was arranged by the chemists of Washington and other scientists in the capital for the recent visit of foreign chemists that the visitors all but lacked the necessary physical strength to keep all of the appointments which had been made for them. The visiting chemists were: Dr. F. G. Donnan, professor of chemistry at University College, London; Dr. James C. Irvine, principal and vice-chancellor, University of St. Andrews, St. Andrews, Scotland; Prof. Giuseppe Bruni, of the Polytechnical School at Milan, Italy, and Prof. A. F. Holleman, of the University of Amsterdam.

The visitors were the guests of honor at a dinner on April 17 tendered jointly by the Washington Academy of Sciences, the Philosophical Society of Washington and the Chemical Society of Washington. After the dinner Dr. Donnan and Dr. Irvine delivered addresses in the auditorium of the Interior Department.

Dr. Charles L. Parsons, secretary of the American Chemical Society, on April 16 arranged a dinner for the visiting chemists and twenty other guests, including the Italian Ambassador, at the Cosmos Club. During the course of that dinner Ambassador Caetani announced that he had suggested to Italy's Premier that arrangements be made for the sending to America, at public expense, a number of graduate engineers each year, with the idea of giving them the advantage of a certain amount of American experience and contact with American ideas of engineering efficiency. On the same occasion Dr. Irvine stated that he is advising British students to do post-graduate work in the United States.

Each of the visitors expressed astonishment at the rapid growth of scientific development in the United States. Fifteen years ago, it was pointed out by one of the visitors, America was known as the source of certain scientific work of a very high character, but the amount of work being done was not great. The visitors also were much impressed by the facilities which we possess in the way of laboratories, books of reference and current technical publications.

Australia Has Surplus Arsenic

An increasing volume of white arsenic imported from Australia is expected as a result of reports reaching Washington from that country. Australia makes its own sheep dips and other arsenicals, but its production of white arsenic is in excess of those requirements. The present level of prices is sufficient to make it profitable to send this surplus to the United States.

Sir J. J. Thomson Visits G. E.

Sir Joseph J. Thomson, Master of Trinity College, Cambridge, England, spent 2 days of his stay in this country at the research laboratories of the General Electric Co., Schenectady, on April 6 and 7, previous to his series of lectures before the Franklin Institute on "The Electron in Chemistry."

He gave an informal talk to the laboratory staff and engineers, inspected the works, and evinced much interest in the latest developments as demonstrated during his visit. He inspected the various types of radio vacuum tubes employing thoriated filaments to obtain greater electron emmission, examined the 1,000-kw. tube set and other features.

Sir Joseph was accompanied by Dr. R. B. Owens, secretary of the Franklin Institute, and W. C. L. Eglin, vice-president. In the accompanying photograph he is shown with them and with Dr. Irving Langmuir and Dr. Coolidge.

BEST MINDS IN SCIENCE MEET

Sir Joseph J. Thomson, Master of Trinity College, Cambridge, England, is here shown with Dr. Irving Langmuir, assistant director, G-E Laboratory; Dr. R. B. Owens, secretary of the Franklin Institute; W. C. L. Eglin, vice-president, the Franklin Institute; and Dr. W. D. Coolidge, inventor of the Coolidge X-ray tube. When this photograph was taken Sir Joseph was examining a 20-kw. radio tube.

A.E.S. Meets May 3-5

Two Symposiums, an Inspection of Dorr Plant and Social Events on Program

With headquarters at the Commodore Hotel, New York, the American Electrochemical Society is to hold its annual meeting May 3 to 5. Technical sessions are to be held on Thursday, Friday and Saturday.

Members of several New York sections of scientific organizations have been invited to attend these meetings. The list includes: American Chemical Society, Society of Chemical Industry, American Institute of Chemical Engineers, Société de Chimie Industrielle, New Jersey Chemical Society, American Institute of Mining and Metallurgical Engineers, Metallurgical Society of America, American Institute of Electrical Engineers, American Electroplaters' Society, National Electric Light Association and New York Electrical Society.

On Thursday, May 3, the program of the day includes a symposium on "Electrode Potentials." With W. G. Horsch as chairman the following men are to present papers in this connection: H. S. Taylor, H. C. Howard, M. Knobel, P. Caplan, M. Eiseman, N. H. Furman, A. H. Aten, A. Lowy, H. S. Frank, W. Blum, C. G. Schluederberg, F. A. J. FitzGerald, H. S. Rawdon, H. E. Haring, A. K. Graham, M. R. Thompson, H. D. Heneline, W. Baughman.

The program of the day includes an inspection of the McGraw-Hill plant at noon and an informal luncheon following. In the evening the Electrothermic Division Council is to hold a dinner.

The Friday morning session includes the following papers:

J. C. Woodson: Heat Insulating Material for Electrically Heated Apparatus.

F. W. Brooke: Methods of Handling Materials in the Electric Furnace and the Best Type of Furnace to Use.

M. deKay Thompson and P. K. Frölich: The Conversion of Diamonds to Graphite at High Temperatures.

A. E. R. Westman: The Relation Between Current, Voltage and the Length of the Carbon Arcs.

C. E. Williams, C. E. Sims and C. A. Newhall: Electric Furnace Detinning and Production of Synthetic Gray Iron From Tin Plate Scrap.

C. W. Drury: Cobalt—Its Production and Uses.

F. C. Kelley: Chromizing.

Following the technical meeting members will journey to Westport, Conn., where the plant of the Dorr Co. is to be visited. Following the plant inspection there is to be a dinner and dance at the Westport Country Club.

The final meeting on Saturday morning, includes a symposium on "Production and Application of Rarer Metals." Speakers include: C. James, H. S. Cooper, H. W. Gillett, E. L. Mack, B. D. Saklatwalla, R. W. Moore, J. A. Holladay, T. R. Cunningham, R. P. Neville, E. Wichers, L. Jordan and F. E. Carter.

Moroccan Phosphate May Rival Florida Deposits

Huge Amounts of Rich Rock Are Becoming Available Through Intensive Development

ADDITIONAL information as to the phosphate situation in Morocco has become available. The 1922 production was 80,583 tons. It is estimated that 300,000 tons will be exported in 1923 and that by 1927 a production of 1,100,000 tons will have been attained.

The increase in production is being made possible by the installation of mechanical handling at Casablanca, the port. The narrow-gage railway connecting Casablanca and the mines is being changed to a broad-gage line. The influence the broad-gage railroad will have on the movement of these phosphates is indicated by the fact that the freight rate will be reduced from 52 francs to 16 francs per ton.

The phosphate beds are situated 160 kilometers south of Casablanca. The beds themselves occur in an area 75 kilometers in length which varies from 5 to 35 kilometers in breadth. The beds are in horizontal layers several meters in thickness. The percentage of phosphate is said to average from 73 to 78 per cent. Reports from disinterested sources agree that there are very extensive deposits of very high-grade phosphate of lime.

For the past 2 years the deposits have been under the direct control of a state monopoly. It is conducted under a board of management with wide powers vested in a head manager, which gives it the flexibility of administration enjoyed by a private industry. At the same time the enterprise has been benefited greatly by its governmental character, as it has made easy the construction of railways and the providing of port facilities which would have taken a much longer time to arrange had private interests only been concerned.

While the Moroccan authorities claim that a small profit now is being realized from these operations, there is reason to believe that all phosphate exported is being sold at a loss. The development of the deposits, however, and the facilities connected with the whole enterprise are being conducted with assurance because Europe's annual requirements of phosphate exceed four million tons. When provisions are complete to handle production and shipments in quantity, there seems little doubt of the ability to compete successfully with the Florida product.

Gives Fund for Soap Study

The Palmolive Co., of Milwaukee, announces the establishment of a Fellowship for the study of the fundamental principles connected with the detergent action of soap. The Fellowship carries an annual stipend of $2,000. The Fellow will have the privilege of pursuing his studies at any institution in the country which is properly equipped for this purpose. The candidate must possess the equivalent of a Master's degree.

The Fellowship will be awarded by a committee consisting of the following: W. D. Bancroft, professor of chemistry, Cornell University; E. C. Franklin, American Chemical Society; H. N. Holmes, chairman colloid division, National Research Council; Victor Lenher, professor of chemistry, University of Wisconsin; J. C. Sellmer, representing Palmolive Co.

General Motors to Produce Anti-Knock Gasoline

A subsidiary of the General Motors Corporation, to be known as the General Motors Chemical Co., is about to use gasoline filling stations as a medium for placing a modified type of gasoline on the market. This new type of gasoline, it is announced, contains an anti-knock compound which has been developed after many years of experiment by the General Motors Research Corporation.

News Notes

The oldest powder yard in the country went out of existence recently when E. E. du Pont de Nemours & Co. closed their plant on the Brandywine. This yard was founded in 1802.

Cement manufacturers are reported to be considering a change from cloth to paper bags for handling their product. Decreased cost without increased loss of product through breakage or dampening is expected if the change is made.

Changes in tariff rates have been requested by no less than 159 applicants. It is understood that in addition to the list of seventeen commodities already being investigated another group of eight is now being prepared for investigation. The list will of course be acted on only with the President's approval.

Czecho-Slovakian industry is staging a "comeback" according to reports received here by the consul general of that country. The greatest improvements noted are in iron, coal and engineering industries. Machinery for sugar works, breweries and alcohol distilleries is being shipped in increasing amounts to France, Belgium and Italy.

Paper and ink as related in the printing industry were discussed before the Society of Chemical Industry at its New York meeting on April 13. The nature and composition of inks, the causes of fading of lithographs and the inter-relationship of paper and ink colors in printing were the topics of the evening.

The Electric Steel Founders' Research Group held a convention at East Aurora, N. Y., April 13 and 14. The gathering was one of the most successful in the history of the group, which has been in existence since 1920. Representatives and executives from the five electric steel casting plants forming the Research Group joined in a discussion of important steel foundry problems covering both technical and commercial phases. W. H. Worrilow, president of Lebanon Steel Foundry, Lebanon, Pa., presided over the sessions.

The principal effort of the Division of Research Extension of the National Research Council during the coming year will be to raise funds in sufficient amount to permit intensive work on the tables of physical and chemical constants, being edited by the Council.

Eighteen American students have been awarded scholarships by the American-Scandinavian foundation. Of this number several are to study chemistry, engineering and metallurgy in Denmark and Sweden.

French naval stores are now practically exhausted. Commercial Attaché C. L. Jones reports that there is probably not more than 100 tons in warehouses in the Bordeaux district. It is yet too early to estimate the size of the crop, but it is evident that it will exceed 1922 crop, which was about 32,000 metric tons of turpentine and 118,000 tons of rosin.

Spraying potatoes with copper salts such as Bordeaux, Pickering mixtures and likewise barium water not only has the effect of controlling the diseases for which they are applied but, according to the United States Department of Agriculture, thorough and timely spraying usually greatly increases the yield, influences the composition of the tubers and increases their keeping qualities in storage.

A course in illuminating gas manufacture and distribution is to be given at Columbia University this summer by Prof. J. J. Morgan. This course will include plant inspection, laboratory work and a thorough lecture treatment of the entire subject. To furnish a motive for the work the class is to be given the problem of laying out a gas plant for a small city.

To determine how long it takes to "tire" a metal to the point where it gives way under repeated strains or shocks the Engineering Foundation, in collaboration with the National Research Council, the Copper and Brass Research Association, the University of Illinois, the General Electric Co., Western Electric Co. and other corporations has undertaken a comprehensive program of research to establish the endurance limits or so-called "fatigue" of copper, brass, bronze and other metals.

Facts and Figures That Influence Trade in Chemical Products

Market Conditions

Current Prices
Imports and Exports
The Trend of Business

Speculative Trading in Chemicals No Longer A Market Factor

Consuming Buying Moderate Owing to Heavy Contract Holdings—Tartaric Acid Advances in Price—Fluoride of Soda Strong—Metal Salts Unchanged But Easy in Tone—Less Interest in Arsenic

CENSUS reports, just issued, covering production of chemicals for 1921, in general reveal a healthy growth as compared with 1914. However, material increases over the 1921 figures may be expected in the current year if present rate of output is maintained or even approximated for the balance of the year.

With different consuming trades covered by contracts, new business placed in the past week was not heavy. As prices for the speculative commodities are high enough to be considered dangerous, there is a decided falling off in activity on the part of speculators, and this gives the market a quieter appearance than actually is the case when measured by normal standards, as different sellers report a fair average volume of business. Prices for the most part are fluctuating within narrow limits. Seasonable demand and limited stocks have a strengthening effect on some chemicals and the position of foreign markets also has an influence on many commodities. The easy tone to basic metals has caused buyers of metal salts to regard present prices as safe from advances and they are buying in a hand to mouth way with the hope that values will work more in their favor. Permanganate of potash is holding attention, but prices are irregular and demand is in evidence only on dips in the market. There are well defined rumors of short interests in arsenic, but if correct, attempts to cover are well concealed; however, spasmodic buying on weak spots is regarded as significant. Copper sulphate, which was selling freely for export a year ago, is now depressed by the weight of foreign offerings in our markets, and prices went to still lower levels during the week as the result of selling pressure. Demand for fertilizer chemicals is not expected to show any immediate improvement, and interest is mainly confined to prices for deferred shipments. Sulphuric acid is in a very strong position, with producers sold ahead, and it is difficult to negotiate business for prompt deliveries. Tartaric acid moved into higher prices during the week and with German grades out of the question, the prospect for low priced imported material is not bright.

Acetic Acid—Demand has not picked up enough to bring about any material change and raw materials likewise offer nothing new, so the price schedule of makers is on an unchanged basis. Business during the week was described as routine. Asking prices are $3.17½ for 28 per cent and $6.35 for 56 per cent, with glacial at $12.05@$12.85.

Citric Acid—Firmness is the keynote in this market. Domestic offerings continue to be quoted at 49c. per lb., but the bulk of home production is sold ahead and this places considerable dependence on imported. Foreign markets are strong and 52c. per lb. is asked for shipments. Some spot offerings are held here which were imported at more favorable prices and holders are not eager to sell below replacement costs, so the latter also is quoted at 52c. per lb.

Formic Acid—Prices have not been disturbed by trading, in fact the call for fresh supplies is described as very moderate. For domestic acid the asking price is maintained at 16c. to 17c. per lb. for 85 per cent. Imported acid was not pressing for sale but was easy in tone because of the lack of buying interest. Prices for the latter were 14½@14¾c. per lb. Shipments were practically on the same level as spot.

Hydrofluoric Acid — Consumers are not active at present and seasonable dullness is found in most quarters. Considerable interest in future prices, however, has arisen because of reports that raw materials, especially fluorspar, are becoming scarcer and this is taken as an indication that values later in the year will be higher. Acid grades of fluorspar, 98½ per cent or better, crushed, are offered at $27.50 per ton delivered. No change in acid prices has taken place, and for the time slow consuming demand is the governing factor. Quotations are 7@7¾c. for the 30 per cent and 11@11½c. for 48 per cent.

Oxalic Acid—There has been less disposition on the part of sellers to shade prices and difficulties surrounding shipments have given a firmer feeling to prices, which is reflected in the market for domestic offerings as well as imported. Prices for domestic are reported as strong at 12¾@13c. per lb., f.o.b. works. Imported is held at 13½@14c. per lb., according to quantity and seller.

Tartaric Acid—Predictions of higher prices have been verified, as early last week there was a general rise of one cent per lb. for both domestic and imported. Demand is holding up well and recent advances have failed to check the buying movement. Current prices are 36c. per lb. for domestic and 35½c. per lb. for imported. Reports from the Italian market indicate firm conditions there.

Potashes

Bichromate of Potash—An easy tone continued throughout the week and while 10¾c. per lb. is given as the open quotation for round lots at the works, this price is not firm and 10½c. per lb. is said to be possible on firm bids. Despite the apparent easy tone to prices it is believed that there are no heavy stocks to work off and increased buying would be immediately felt.

Caustic Potash — Sales of two cars afloat were put through at 8c. per lb. Spot goods sold at 8½c. per lb. and despite reports of limited stocks the undercurrent seemed less strong than a week ago. Many consumers are interested only at price concessions and lack of actual buying interest prevents any real strength to prices.

Chlorate of Potash—This chemical has been marked by the steady position of values. Imported offerings are held at an inside figure of 7½c. per lb. and shipments also are steady at that figure. Domestic is moving normally at unchanged price levels of 8½c. per lb. and upwards, according to quantity. These prices being f.o.b. works. Large consumers are covered by contracts.

Permanganate of Potash — Developments in permanganate are being followed more closely than most of the other items in the chemical list. Demand is fair, but buyers have their own views about values and place orders only when they think prices are

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	178.31
Last week	181.48
April, 1918 (high)	286.00
April, 1919	231.00
April, 1920	261.00
April, 1921 (low)	140.00
April, 1922	158.00

Another slight recession in the index number occurred last week. The decline was brought about by the ½c. reduction in crude cottonseed oil and the easier position of formaldehyde.

right. The general asking price on spot is 24c. per lb., but this has not been entirely adhered to and sales were reported fractionally under that level. Goods afloat were available at 23c. per lb. On shipments 22½c. per lb. was asked for April and 21½c. per lb. for May.

Potash First Sorts—Leading sellers have turned down business under their asking levels and a very firm market continues. Buyers are not active, but this is offset by reduced production and limited stocks in sellers' hands. Prices are on a basis of 9c. per lb. for moderate sized lots.

Sodas

Acetate of Soda—It is a buyers' market and values are easy under selling pressure. As low as 5½c. per lb. was heard during the week and even at the reduced prices, buying has not been stimulated to any extent.

Bichromate of Soda—Raw materials used in the manufacture of bichromate are holding a steady position and this is reflected in the market for the finished product. Producers are maintaining prices at 7½c. per lb., works, for round lots. Most of the present movement from the plants is against old orders with new business quiet. In the spot market 7¾@8c. per lb. is the ruling quotation.

Caustic Soda—Independent interests which a short time ago were reported to be finding difficulty in placing goods for export are now said to be getting a good share of that business. The so-called outside brands have sold at 3.35c. per lb., f.a.s., while standard brands are held at 3.45c. per lb., although the latter do not seem to be as strong as previously. Domestic buyers were not much in evidence last week and small lot business predominated. The contract price is held at 2½c. per lb., works, basis 60 per cent. Spot material is offered at 3¾c. per lb. for less carlots, 76 per cent solid.

Chlorate of Soda—Off-grade material of foreign make is still on the market with holders willing to do business on private terms. On prime goods the price is well maintained at 6½c. per lb. No change has taken place in domestic makes and sellers hold out for an inside price of 6¾c. per lb., works.

Cyanide of Soda—Reports are now current that two new producing companies are preparing to enter the field in the West. Of course it will be some time before they will be able to influence values. Imported cyanide is offered rather freely in the local market but is not meeting with a ready sale and prices are easy at 20@21c. per lb. Domestic cyanide is steady at 22½@23c. per lb.

Fluoride of Soda—Producing costs are on the upward trend and indications point to further price advances. During the week business at 9½c. per lb. was said to have been turned down and 9¾c. per lb. is held as the lowest figure at which sellers will accept orders.

Nitrate of Soda—With the heavy buying season over, prices for nitrate are a little weaker and selling pressure has become more of a factor. Importers as a rule are not disposed to shade asking prices of $2.65 per 100 lb., but in the open market it was possible to do $2.60 per 100 lb. and possibly a little lower. Considerable interest is taken in future prices but offerings under $2.50 per 100 lb. have failed to bring buyers into the market. On the one hand is the attempt in primary points to curtail production and stabilize prices and on the other the uncertainty about the extent to which European markets may be expected to buy. If the latter purchase sparingly it is held that prices will be made attractive to stimulate American buying.

Prussiate of Soda—Competing materials have been offered at more attractive relative prices and this has had the effect of cutting down the demand for prussiate. This may be illustrated in the case of dry colors where the chemical colors are not finding the outlet which is noted for the earth colors. Prices for yellow prussiate were decidedly easier last week. Offerings were available at 17¾c. per lb. and even this price was said to be none too strong.

Soda Ash—Scattered buying on new account is noted but contract withdrawals continue heavy and this is the feature of the market. Prices are steady, with hardly any chance for a lowering of values. In fact some well posted traders say indications favor rises in quotations. Production is still at close to capacity of plants but is equalled by consuming requirements. Quotations are holding at $1.75 in bags and $1.95 in barrels.

Miscellaneous

Arsenic—In spite of reports that prominent interests are said to need arsenic in order to take care of sales of calcium arsenate, the market last week showed a falling off in interest. Some sellers hold that buyers are holding out in order to let values ease off through lack of support. The undertone was a shade easier. Spot goods were quoted at 15½@15¾c. per lb. Mexican arsenic for shipment was offered at 15c. per lb. and Japanese was reported to have sold at 14¼c. per lb. Cables to Washington state that Australia has surplus stocks of arsenic which can compete in price in our markets.

Calcium Arsenate—Fundamental conditions have undergone no change and as demand is expected to continue for three months and no way is in sight to make up the prospective shortage, the outlook can hardly be interpreted as favoring price declines. Sellers appear to be willing to hold prices from advancing and during the week it was possible to do 17¾c. per lb.

Copper Sulphate—Inquiry was more active and sales of round lots were reported in both imported and domestic grades. Yet many sellers say business is still below expectations. There is no definite quotation on imported and buyers are taking advantage of the situation to depress values by making low bids. Sales were made at 5¼c. per lb. Domestic grades are more steadily held than imported but there are differences according to brand and seller with 6¼c. to 5¾c. per lb. asked.

Tin Oxide—In common with the other metals tin has worked into an easier position, but, while this was reflected in a slightly easier feeling for tin oxide, the leading factors maintained prices on the basis of 52c. per lb. Trading was slow, buyers holding off for further developments because of the unsettled state of the metal.

Formaldehyde—It was reported that the cheap lots have all been cleaned up, some business passing early in the week as low as 13¾c. per lb. Most of the sales went through around 14c. At the close the situation firmed up somewhat and "outside" lots were held at 14¼c. per lb. First hands maintained prices on the 16c. basis. The market was irregular all through the early part of the week.

Sulphate of Ammonia—Local sellers report export inquiry of fair volume and sales are said to have been made to Japan in the past few days. The quotation, f.a.s. New York, is generally given at 3.90c. per lb., but with firm business in hand it is stated that 3.85c. can be done.

Alcohol Trade Slow

Some traders reported fair business in alcohol, but in the majority of instances business was described as quiet. Prices did not change, but the undertone was barely steady, especially on denatured spirits. The No. 1 denatured was offered freely at 39c. per gal., 188 proof. Ethyl spirits, 190 proof, was unchanged at $4.75@$4.85 per gal. Methanol, 95 per cent, was available at $1.19@$1.21 per gal.

Trade Notes

Export duty on copra from Fiji has been fixed at 10 shillings per ton, which is a reduction of 5 shillings per ton from the rate effective last year.

The Tannin Corporation will move on May 1 from 80 Maiden Lane to larger quarters in the new building at 11 Pershing Square.

J. M. Lowe, manager and chief chemist of the Edgewater, N. J., plant of the Midland Linseed Products Co., returned last week from Toledo.

Herbert J. Cantrell, identified with the cottonseed oil business since 1907 and a member of the New York Produce Exchange, has retired from business.

H. D. Ruhm of 136 Liberty St., New York, is now in the South in connection with his interests in phosphate rock and calcium arsenate interests.

Coal-Tar Products

Active Trading in Salicylic Acid—Phenol Higher in Second Hands—Steady Call for Naphthalene—Benzene Quiet

AN active demand for salicylic acid set in toward the close and the market strengthened in all directions. While no actual advance in prices was announced by leading producers, the continued buying made operators more cautious and offerings late in the week were very much smaller. The buying came from a good source and it looked as if an upward movement in prices for the salicylates was in order. The phenol situation did not change for the better. The offerings were scanty and it was doubtful whether resale parcels could have been picked up for less than 56c. per lb., immediate delivery. Producers have not changed their views, being well sold up on nearby material. In naphthalene the demand continues active, with distributors anxious for goods purchased some time ago. It is reported that several domestic producers have not yet delivered March commitments. There was no buying interest in forward material; traders see no reason for a material reduction in prices, pointing to the strong market for crude.

The tariff situation in connection with cresol attracted attention. The Treasury Department, in a ruling handed down recently, held that the duty of 7c. per lb. and 55 per cent was the proper rate on cresol containing less than 5 per cent of tar acid distilling below 190 deg. C. Importers had little faith in the claim for free entry under paragraph 1549. However, it is felt that the application for a 50 per cent reduction in the rate of duty will be more successful, as domestic producers appear satisfied that the existing rate is too high. The market for cresylic acid at the close was firm. Benzene demand continues quiet, but prices were nominally unchanged. Solvent naphtha was in scanty supply and firm. Pure xylene was strong on spot around the 75c. basis. Second hands were asking around $1 per lb.

Coal-Tar Crudes, Etc.

Benzene—Offerings were plentiful, but prices underwent no change, as traders take the stand that new business will soon come forward in volume and surplus stocks are really not burdensome. Benzene, 90 per cent, in tanks. held at 27c. per gal., contract basis, the customary premium obtaining on small quantities. On the pure, water-white, the market held at 30@32c. per gal., immediate delivery.

Cresylic Acid—With no prospects for a change in the interpretation of the tariff law, traders have abandoned all hope for free entry of the lower grades of this acid. Attention will now be directed to the application for a 50 per cent reduction in the rate of duty on cresylic acid, which has been agreed upon by both importers and domestic producers, the prevailing rate being prohibitive and working many hardships on the consuming industry. The foreign markets were firm, holding on the basis of 85c. per gal., in bond, prompt shipment from the other side, New York, for the 97 per cent material. Spot 97 per cent acid closed nominally at $1.40 per gal., with the lower grades at $1.30.

Naphthalene—Demand for naphthalene was active and with producers behind in making deliveries, the market for spot goods presented a firm appearance. With the weather unseasonable, actual consuming demand for ball naphthalene has not been so urgent, but distributors, nevertheless, are anxious about their supplies. The market settled at 9½@9¾c. per lb., carlot basis. Traders held out little hope for a material reduction in new contract prices, owing to the strong position of crude. Crude naphthalene of good color for shipment from abroad settled around ¾c. per lb.

Phenol—The offerings of resale material were scanty and prices at the close were strong and more or less nominal. Early in the week several parcels brought 55c. per lb., but later it was said that nothing could have been picked up in outside channels at less than 56c. per lb., immediate delivery. Leading domestic producers have not changed their selling views, delivering all they can make on the old basis of 26c. per lb. New production can hardly come on the market for some time to come, with the result that the market prospects covering nearby material are in an exceedingly strong position. The extraordinary demand for phenol is attributed to the absorbtion of this material by manufacturers of phenol resins.

Aniline Oil—Producers report a moderate amount of business, but with stocks not pressing on the market, quotations were maintained on the basis of 16c. per lb., round lots. Scattered business was put through at this figure.

Beta-Naphthol—No further changes were reported in the market for beta-naphthol, leading handlers asking 23½c. per lb., while in outside quarters there were offerings at 23c. per lb.

Dimethylaniline—The demand for dimethylaniline was fair and producers reported a steady market, maintaining prices on the former basis of 42c. per lb., in drums, immediate delivery.

Paranitraniline—There was more buying interest and prices steadied in some directions. Quotations varied, depending upon the make, etc. Most traders were asking around 75c. per lb.

Toluene—The market was a featureless affair, production being restricted because of the limited outlet for this material. Nominal quotations were repeated at 30@32c. per gal.

Xylene—Because of higher manufacturing costs leading interests have raised their views on the pure to 75c. per gal., carlot basis, forward delivery, to consumers only.

Cottonseed Oil Visible Down to 846,000 Barrels

The Bureau of Census report on cottonseed products, issued on Tuesday, April 17, indicated that 167,000 barrels of cottonseed oil was consumed during the month of March. This compares with 194,000 barrels in February and 204,000 barrels in March a year ago. The showing was not so good as trade leaders expected, but, considering the small visible supply, the situation is regarded as firm and no real downward movement in prices of old crop oil is looked for at just this time. The visible supply of oil on March 31 is estimated at 846,000 barrels, which compares with 963,000 barrels on the corresponding date a year ago.

Receipts of cottonseed at the mills from Aug. 1 to March 31 amounted to 3,167,750 tons, against 2,857,824 tons for the corresponding period a year ago. The amount of seed actually crushed for the eight months ending with March 31 amounted to 3,016,365 tons, against 2,853,762 tons for the same time a year ago. Production of crude oil for the eight months ending with the last day in March amounted to 922,224,522 pounds, contrasted with 878,821,894 pounds for the corresponding period a year ago. The production of refined oil for the eight months covered by the report reached the total of 779,015,120 pounds, which compares with 744,804,378 pounds for the same period last year.

Stocks of cottonseed on March 31 were placed at 159,922 tons, against 101,193 tons on the same day a year ago. The stocks of crude oil on hand March 31 amounted to 60,137,116 pounds, which compares with 54,907,155 pounds a year ago. The stocks of refined cottonseed oil on the last day of March amounted to 239,925,412 pounds, contrasted with 299,860,679 pounds on the corresponding date a year ago.

Treasury Decision Upholds Duty on Cresol

The Collector of Customs at New York last week received a decision from the Treasury Department at Washington, upholding an appraiser's report on an importation of cresol, where the entry was classified as dutiable under paragraph 27 of the tariff act at the rate of 7c. per pound and 55 per cent ad valorem. Attorneys for the importers had contended that free entry should be given under paragraph 1549 of the tariff act, which provides for free entry of all distillates of any of the tars mentioned in the paragraph which, on being subject to distillation, yield in the portion distilling below 190 deg. C. a quantity of tar acids less than 5 per cent of the original distillate.

Vegetable Oils and Fats

Crude Cottonseed Lower—Coconut Sales at 9¼c. New York—Linseed Holds Firm—Tallow Steady

THE cottonseed oil market developed weakness on the showing made in March, which took the trade by surprise. The Bureau of Census report indicated consumption of 167,000 barrels, a good volume, but not quite up to expectations. Another feature was the activity in coconut oil. The New York market was unsettled early in the week but steadied later on buying for export, evidently to satisfy a short account in London. Linseed was nominally unchanged, with sentiment on futures somewhat easier because of the freer movement of Indian seed and the tendency to increase the Argentine estimates on the exportable surplus. Soya was higher in the forward positions. Trading, taken as a whole, was good on nearby material, but inactive on futures.

Linseed Oil—At the close crushers offered April-May oil at $1.17 per gallon, carload lots, cooperage included. Several operators also named this figure on June business, but appeared willing to do $1.14 on July and $1.10 on August forward. New business was inactive and large consumers showed no anxiety for summer oil, many of them entertaining bearish views because of the more favorable seed situation. The Argentine Ministry of Agriculture revised the final estimate on the crop, bringing the figures up to 52,960,000 bushels. The previous "final" estimate put the crop at 47,023,000 bushels, while early in the season a production of 61,240,000 bushels was the forecast. India shipped 528,000 bushels of new crop seed last week, indicating that the movement was on. An exportable surplus of 12,000,000 bushels may be expected from India. A full cargo of Argentine seed now afloat sold late in the week at $2.39½ per bushel, c.i.f. New York. Linseed cake was steady at $36 per ton, f.a.s. New York.

Cottonseed Oil—Prices eased off in all directions on the drop in lard and the less favorable showing on March consumption as revealed in the Census figures. The visible supply of oil on the last day of March was placed at 846,000 barrels, which compares with 963,000 barrels on the corresponding date a year ago, a bullish statistical situation according to trade authorities. At the close it was felt that prices will advance on the first showing of strength in lard. Lard stocks in Chicago on April 15 amounted to 29,327,935 pounds, against 13,495,496 pounds on April 1. Hogs were easy all week on heavy receipts. Exports of cottonseed oil for the eight months ending with March 31 amounted to 48,984,982 pounds, against 75,195,473 pounds for the corresponding period a year ago. Crude oil sold in the Southeast at 10c., f.o.b. mills. Bleachable oil sold at 11¼c. per lb., buyers' tanks, f.o.b. New York. There were rumors of new crop (Oct.-Nov.-Dec.) crude selling at 7¾c., f.o.b. Texas mills.

Coconut Oil—The sale of 35 tank cars of Ceylon type oil was reported at 9¼c. per lb., f.o.b. New York. One lot sold down to 9¼c. during the past week. This naturally steadied prices a little and at the close 9⅜c. was the market. Europe bought here and, according to traders, this represented covering by shorts. The sale of 100 tons of Central American copra was reported at 5¼c., c.i.f. New York. On Manila sundried, there were offerings at 5.75c., c.i.f. New York. Coconut cake was dull and the price was lowered to $33 per ton.

Corn Oil—Crude closed at 10¼@10⅜c. per lb. sellers' tanks, Middle Western points. Refined in barrels, New York, held at 13¼@13⅜c. per lb.

China Wood—A small lot brought 37c. per lb. on spot. May arrival was available at 30c. with June-July shipment at 25½@26c. per lb. On the Pacific coast 25c. was asked on May-June sellers' tanks.

Palm Oil—Trading was slow and prices on futures irregular. Niger oil for shipment closed at 8¼c. asked. Lagos held at 8¼c. With the movement of oil in Africa about to set in operators were disposed to hold off.

Soya Bean Oil—April shipments from the coast held steady at 10¼c., sellers' tanks, duty paid. On futures the asking price was raised to 10⅜c., coast basis. In New York City one car of prompt oil was held at 10⅜c., duty paid.

Fish Oils—The sale of several tank cars of crude menhaden oil was reported at 50c. per gal., which compares with 55c., the ruling price a week ago. The transactions, of course, cover futures "if made" as the season is fully two months away. Newfoundland cod oil was offered at 68c. per gal. A shipment of sardine oil arrived here from the Orient. There were no changes in the crude whale oil situation.

Tallow and Greases—The sale of 10 cars of extra special tallow was reported at 9c. per lb., f.o.b. plant, the prices showing no change for the entire week. Several shipments of South American tallow arrived here last week. At the weekly London auction, held on April 17, 1,442 csk. of tallow were offered and 720 csk. were disposed of. Prices were unchanged to 6d. higher. Oleo stearine sold at 10⅜c. and later at 10¼c., f.o.b. New York. Choice yellow grease was scarce at 8¼c. New York.

Miscellaneous Materials

Glycerine—The market was a dull affair, but prices did not ease off. Refiners take the stand that contract business will come along in volume in a short time and, with a firm situation in crude, they refuse to force the market. C. P. held at 18c. per lb., in drums, carload lots, and 20c. in tins. Dynamite sold at 16¼c. in this territory. The leading "buyers" have been reselling scattered lots without depressing the views of actual holders in producing circles. Crude soap lye, basis 80 per cent, held at 10¼c. loose in the West, and 10¼@10⅜c. in the East. Saponification was wholly nominal at 12¼@12⅜c. per lb. loose, carload lots.

Casein—The past week witnessed the arrival of 7,450 pkg. of casein from various foreign sources of supply, but principally New Zealand and the Argentine. The market was unsettled on "nearby" material. On spot most traders held out for 25c. on the technical grade.

Naval Stores—The market was easy early in the week, the price for turpentine declining steadily until it reached $1.48 per gal. in New York and $1.40 per gal. in Savannah. Late in the week business showed moderate improvement. The arrival of new season's production is increasing and stocks are gradually accumulating. Export business was inactive. Steam distilled turpentine settled at $1.43 per gal. Rosins went off 5c. per barrel, the "B" grade settling at $6.15. Trading was slow, even after the decline. The market for tar and rosin oils was quotably unchanged.

Shellac—Lower cables from Calcutta and London unsettled the market and prices at the close were weak. T. N. was offered down to 71c. per lb., spot New York, round-lot basis. Superfine orange closed nominally at 76c., with the ordinary at 74c. per lb. Bleached, bonedry, closed at 84@86c. per lb., immediate and nearby delivery. Demand was moderate, the decline naturally frightening prospective buyers.

White Lead—The easier market for the metal failed to change the attitude of producers of lead pigments. Trading in the pigments since the first of the year has been active, notwithstanding the numerous upward revisions in prices. Standard dry white lead (basic carbonate) held at 9⅜c. per lb. in casks, carload lots. The sulphate was unchanged at 9¼c.

Zinc Oxide—There was an easier market for spelter as well as ore, yet this failed to weaken the ideas of producers of zinc oxide. First-hands reported a good volume of orders on their books and production appears to be sold up over the next two months in more than one direction. American process lead free was available at 8c. per lb., carload lots. French process, red seal, was offered at 9¾c., carload lots.

Imports at the Port of New York

April 13 to April 19

ACIDS—2 bbl. coal tar, Hull, Merck & Co.; 10 csk. cresylic, London, T. G. Cooper; 76 dr. cresylic, Liverpool, W. E. Jordan; 135 dr. cresylic, Liverpool, Order; 100 csk. citric, Palermo, R. F. Downing & Co.; 150 csk. citric, Palermo, Order; 6 dr. cresylic, Liverpool, Monsanto Chem. Wks.; 100 dr. cresylic, Liverpool, Order; 23 dr. cresylic, Hull, Order; 50 dr. cresylic, Glasgow, Irving Bank-Col. Trust Co.; 24 dr. cresylic, Rotterdam, Bregent Corp. of America.

ALUM—29 csk., Rotterdam, A. Klipstein & Co.; 154 csk. sulphate, Rotterdam, Meteor Products Co.; 66 csk. dr., 500 bg. hydrate, Rotterdam, Greeff & Co.

AMMONIUM—50 cs. chloride, Liverpool, Wing & Evans; 10 csk. carbonate, Liverpool, Brown Bros. & Co.; 10 csk. carbonate, Liverpool, Order.

ANTIMONY SALT—10 bbl., Hamburg, Am. Exchange Nat'l. Bank.

ARSENIC—117 csk., Antwerp, Order; 8 cs., Liverpool, F. B. Vandegrift & Co.; 240 cs., Kobe, Mitsui & Co.; 104 cs. Kobe, J. D. Lewis; 348 cs., Kobe, G. F. Taylor; 220 cs., Kobe, Takata & Co.; 100 cs., Kobe, S. L. John & Co.; 120 cs., Kobe, Order.

ARGOLS—140 bg., Lisbon, Royal Baking Powder Co.

BARIUM—15 csk. hydrate, Hamburg, Order; 52 csk. chloride, Antwerp, Order; 54 csk. chloride, Hamburg, United Hardware Mfg. Co. of Am.

BARYTES—134 bg., Bremen, Equitable Trust Co.; 100 csk., Bremen, Order.

BORATE LIME—6,467 bg., Mejillones, Pacific Coast Borax Co.

CASEIN—165 bg., Hamburg, Manhattan Co.; 120 bg., Melbourne, Order; 80 sk., London, Order; 1,502 bg., Buenos Aires, Brown Bros. & Co.; 1,667 bg., Buenos Aires, Kalbfleisch Corp.; 2,523 sk., Auckland, Asia Banking Corp.; 232 sk., Auckland, Bank of America; 383 sk., Auckland, Order; 775 bg., Bombay, Order.

CHALK—1,100 bg., Antwerp, Irving Bank; 500 tons, London, Baring Bros. & Co.; 400 bg., London, W. E. Miller Co.; 1,397,000 kilos in bulk, Dunkirk, Taintor Trading Co.; 500,000 kilos in bulk, Dunkirk, J. Higman Co.; 1,000 bg., Antwerp, Bankers Trust Co.; 200 bg. powdered, Antwerp, Cooper & Cooper; 500 tons, London, Taintor Trading Co.; 650 pkg. precipitated, Bristol, H. J. Baker & Bros.

CHEMICALS—68 pg., Hamburg, Order; 3 cs. Hamburg, Merck & Co.; 40 csk., Bremen, Roessler & Hasslacher Chem. Co.; 117 pkg., Bremen, Pfaltz & Bauer; 26 pkg., Bremen, Order; 1,000 bg., Antwerp, Order; 430 bg., Hamburg, J. Munroe Co.; 573 bbl., Hamburg, Roessler & Hasslacher Chem. Co.; 298 pkg., Hamburg, Jungmann & Co.; 20 bbl., Hamburg, Pfaltz & Bauer; 20 bbl., Hamburg, Hummel & Robinson; 10 cs., Hamburg, H. Lieber & Co.; 54 csk., Hamburg, Order; 112 pkg., Rotterdam, Order.

COPPER SULPHATE—500 bg., Antwerp, Order; 330 csk., Antwerp, Am. Exchange Nat'l Bank.

COAL-TAR DISTILLATE—16 dr., Glasgow, Guaranty Trust Co.

COLORS—33 csk. earth, Bremen, L. H. Butcher & Co.; 27 pkg., Havre, Irving Bank-Col. Trust Co.; 18 csk. umber, Hull, L. H. Butcher Co.; 20 csk. umber, Hull, Tidewater Chemical Co.; 5 pkg. aniline, Liverpool, Order; 17 pkg. aniline, Genoa, Am. Ex. Nat'l Bank; 27 pkg., Genoa, Nat'l. Aniline & Chem. Co.; 22 pkg., Genoa, Order; 18 bbl. ultramarine blue, Antwerp, Order; 37 csk. earth, Hamburg, Reichard, Coulston, Inc.; 10 csk., Hamburg, J. M. Huber; 359 pkg. red earth, Bristol, Order; 10 csk. aniline, Rotterdam, Kuttroff, Pickardt & Co.

COPRA—51 bg., Montego Bay, Franklin Baker Co.,

CHINA CLAY—200 bg., Bristol, Order; 103 csk., Bristol, C. F. Wilson Co.

CREOSOTE—6 bbl. distillate, Hull, Merck & Co.

CUTCH—3,500 bg., Singapore, Order.

DIVI-DIVI—500 bg., Pampatar, Goldsmith & Co.; 40 bg., Curacao, R. Desvernine.

FULLERS EARTH—1,700 bg., Bristol, L. A. Salomon & Bro.

FERTILIZER—4,000 bg., Hull, Order.

GUMS—2,422 bg. copal, Antwerp, Order; 950 bsk. copal, Antwerp, Order; 60 pkg. copal, London, Chemical Nat'l Bank; 50 pkg. arabic, Hamburg, Order; 98 pg. kauri, Auckland, Brown Bros. & Co.; 108 cs. kauri, Auckland, Guaranty Trust Co.; 100 cs. kauri, Auckland Coal & Iron Nat'l Bank; 706 sk. kauri, Auckland, Nairn Linoleum Co.; 204 cs. kauri, Auckland, Order; 972 bg. copal, Antwerp, W. Schall & Co.; 2,355 pkg. copal, Antwerp, Order; 256 bg. copal, Singapore, Guaranty Trust Co.; 280 bg. copal, Singapore, Order; 100 cs. damar, Batavia, Balfour, Williamson & Co.; 700 cs. damar, Padang, Order; 886 bg. damar, 140 bg. copal, Singapore, Kidder, Peabody & Co.; 740 pkg. damar, 70 bg. copal, Singapore, Baring Bros. & Co.; 489 pkg. copal, Singapore, Irving Bank; 120 pkg. copal, Singapore, Order; 100 cs. damar, Batavia, L. C. Gillespie & Son; 400 cs. do., Batavia, Kidder, Peabody & Co.; 200 cs. do., Batavia, Bank of Manhattan Co.; 300 cs. do., Batavia, Order; 4,974 pkg. kauri, Auckland, various; 575 pkg. karaya, Auckland, Order.

GAMBIER — 261 cs., Singapore, East Asiatic Corp.; 635 pkg., Singapore, E. Baustead & Co.

GLAUBERS SALT—500 bg., Hamburg, A. J. Marcus; 281 csk., Hamburg, Globe Shipping Co.

GLYCERINE—40 dr., Antwerp, N. Y. Trust Co.; 10 dr., Hull, Marx & Rawolle.

HYDROGEN-PEROXIDE — 64 cs., Antwerp, Order.

IRON OXIDE—22 csk., Liverpool, L. H. Butcher & Co.

IRON SULPHATE—92 csk., Antwerp, E. M. Sergeant & Co.

LITHOPONE—180 csk., Bremen, Pfaltz & Bauer; 1,000 csk., Antwerp, Benj. Moore & Co.; 600 csk., Rotterdam, Order.

LOGWOOD EXTRACT—220 bbl., Cape Haitien, Logwood Mfg. Corp.

MAGNESIUM—282 dr. chloride, Innis, Speiden & Co.; 506 dr. chloride, Hamburg, Brown Bros. & Co.; 1,278 bg. carbonate, Glasgow, Bankers Trust Co.

MINERAL WHITE — 1,200 bg., Hull, Hammill & Gillespie; 300 bg., Hull, C. B. Crystal Co.

MYROBALANS — 8,000 pkt., Calcutta, Order; 16,687 pkt., Calcutta, Nat'l City Bank; 2,116 pkt., Calcutta, Standard Bank of South Africa; 7,000 pkt., Bombay, Order.

NICKEL SULPHATE — 25 csk., Hamburg, Blackburn Trading Corp.; 277 csk., Bristol, Perry, Ryer & Co.; 297 csk., Swansea, Order.

NAPHTHALENE—695 pkg., London, Order; 500 bg., London, Irving Bank; 113 bg., Bristol, Order.

NUX VOMICA — 431 bg., Coronada, Order; 200 bg., Bombay, Order.

OILS—Castor, 56 bbl., Hull, Brown Bros. & Co.; 200 bbl., Hull, Order. **Cod** — 100 bbl., Hull, Order; 305 csk., St. Johns, R. Badcock & Co.; 300 csk., St. Johns, National Oil Products Co. **Sardine**—2,000 cs., Kobe, C. A. Reddin; 1,700 cs., Kobe, Cook & Swan Co.; 4,400 cs., Kobe, Balfour, Williamson & Co. **Fusel**—9 dr., Antwerp, Guaranty Trust Co.; 12 csk., Dunkirk, Guaranty Trust Co.; 35 dr., Dunkirk, Order. **Soya Bean**—1,201 tons, Canton, Mitsubishi Shoji Kaisha. **Olive foots** (sulphur oil)—220 bbl., 60 csk. Leghorn, Am. Co. for Int'l Commerce; 150 bbl., Leghorn, Order; 700 bbl., Bari, Nat'l City Bank; 500 bbl., Bari, Leghorn Trading Co.; 400 bbl., Bari, Irving Nat'l Bank; 800 bbl., Bari, Fourth Street Nat'l Bank, Philadelphia; 200 bbl., Bari, Banca Comm. Ital.; 200 bbl., Bari, Bank of Manhattan Co.; 100 bbl., Messina, Leghorn Trading Co.; 100 bbl., Palermo, Order. Peanut—240 cs., Hongkong, Man Hing; 500 bbl., Bristol, Balfour, Williamson & Co.; 160 bbl., Bombay, Order. **Linseed**—478 bbl., Hull, I. R. Boody & Co.; 300 bbl., Hull, Balfour, Williamson & Co.; 750 tons (bulk), Hull, Midland Linseed Products Co.; 128 bbl., Bombay, Order. **Perilla**—500 bbl., Canton, Cook & Swan Co.; 100 bbl., Kobe, Balfour, Williamson & Co.; 2,000 cs., Kobe, Mitsui & Co.; 1,280 bbl., Kobe, Cook & Swan Co. **Palm**—87 csk., Liverpool, D. Bacon; 15 csk., Liverpool, African & Eastern Trading Co.; 156 csk., Liverpool, Order; 173 bbl., Belawan, Nat'l City Bank; 85 csk., Liverpool, D. Bacon; 81 csk., Liverpool, W. Leaman; 29 csk., Liverpool, Order; 534 csk., Rotterdam, Order. **Rapeseed**—200 bbl., Hull, Hudson Oil Co.; 500 bbl., Hull Vacuum Oil Co.; 300 bbl., Hull, Nat'l City Bank; 385 bbl., Hull, Order; 154 bbl., Hull, Order. **China Wood**—100 csk., Shanghai, F. A. Cundill & Co.; 292 csk., Hankow, L. C. Gillespie & Sons; 299 csk., Hankow, Cook & Swan Co.; 237 csk., Hankow, Nat'l City Bank; 50 dr., Hong Kong, Order.

POTASSIUM SALTS—4,000 bg. muriate, Bremen, A. Vogel; 3,916 bg. and quantity in bulk, Antwerp, Société Commerciale des Potasses d'Alsace; 1,000 bg. kainit, Antwerp, Société Commerciale des Potasses d'Alsace; 106 csk. perchlorate, Antwerp, Order; 3,000 bg. sulphate, Bremerhaven, A. Vogel; 9 bbl. prussiate, Hamburg, Broedermann & Litzrodt; 166 dr. caustic, Hamburg, Innis, Speiden & Co.; 20 csk. perchlorate, Swansea, Order; 68 csk. alum, Rotterdam, Meteor Products Co.; 125 bbl. chlorate, Marseilles, Nat'l City Bank.

PITCH—259 bbl., Hull, Order.

QUEBRACHO—1,969 bg., Buenos Aires, Guaranty Trust Co.; 1,836 bg., Buenos Aires, Order; 10,700 bg., Buenos Aires, Tannin Corp.

SOAP STOCK — 300 bbl., Liverpool, Order.

SODIUM SALTS — 18 csk. bisulphite, Hamburg, Order; 168 cs. cyanide, Havre, Asia Banking Corp.; 111 cs. cyanide, Havre, H. W. Peabody & Co.; 134 dr. salts, Hamburg, C. S. Grant & Co.; 5,627 bg. nitrate, Antofagasta, Wessel, Duval & Co.; 5,512 bg. nitrate, Mejillones, Anthony, Gibbs & Co.; 5,572 bg. nitrate, Iquique, Wessel, Duval & Co.; 96 cs. chlorate, Genoa, A. R. Pickering & Co.; 578 bbl. hyposulphite, Marseilles, E. M. Sergeant & Co.

SEEDS—Castor—9,522 bg., Coconada, Order; 12,646 bg., Bombay, Order. **Linseed**—95,245 bg., Buenos Aires, American Linseed Co.; 8,887 bg., Buenos Aires, Order; 8,820 bg., Buenos Aires, L. Dreyfus & Co.

SHELLAC — 10 cs., Hamburg, Irving Nat'l Bank; 200 bg., Calcutta, Lee, Higginson & Co.; 100 bg., Calcutta, Iwai & Co.; 175 bg., Calcutta, Cont. Comm. Nat'l Bank; 500 bg., Calcutta, Chase Nat'l Bank; 100 bg., Calcutta, Bank of Br. West Africa; 100 bg., Calcutta, London & Liverpool Bank of Comm.; 481 bg., Calcutta, Anglo South Am. Bank; 1,841 pkg., Calcutta, Order; 150 pkg., London, Order; 38 bg., garnet, Kasebier-Chatfield Shellac Co.; 200 bg., Calcutta, Am. Exchange Nat'l Bank; 100 pkg., Calcutta, London & Liverpool Bank of Comm.; 425 pkg., Calcutta, Order; 314 pkg., Marseilles, Order.

STARCH—1,250 bg. potato, Rotterdam, Stein, Hall & Co.; 500 bg. do., Rotterdam, Spier, Simmons & Co.

SUMAC—590 bg., Palermo, Order; 700 bg., Palermo, Equitable Trust Co.; 1,400 bg., Palermo, Am. Express Co.; 1,400 bg., Palermo, Bank of N. Y.; 550 pkg., Palermo, Order; 350 bg., Palermo, Order.

TALLOW—728 tc., Buenos Aires, Bank of New York & Trust Co.; 778 tc., Buenos Aires, Swift & Co.; 673 tc., Buenos Aires, Order; 452 csk., Montevideo, Bank of New York & Trust Co.; 78 csk., Buenos Aires, Swift & Co.; 279 csk., Buenos Aires, Order; 127 pipes, Melbourne, Nat'l City Bank; 111 pipes, Melbourne, Nat'l City Bank; 98 pipes, Sydney, Order.

TANNIN—24 csk., Antwerp, Geigy Co.

TALC—1,800 bg., Genoa, Italian Discount & Trust Co.; 900 bg., Genoa, Order.

WAX—2,400 bg. paraffin, London, Order; 72 bg. bees, London, Order; 26 bg. bees, Leghorn, Order; 5 bg. bees, Rio de Janeiro, D. Steengrafe; 75 bg. bees, Rio de Janeiro, London & Braz. Bank; 90 bg. carnauba, Pernambuca, Irving Nat'l Bank.

WHITING—2,000 bg., Antwerp, Brooklyn Trust Co.

WOOL GREASE — 50 bbl., Bremen, A. Klipstein & Co.

ZINC OXIDE — 250 bbl., Marseilles, Nat'l City Bank.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

General Chemicals

Acetic anhydride, 85%, drums	lb.	$0.38 –	....
Acetone, drums	lb.	.22 –	.23
Acid, acetic, 28%, bbl.	100 lb.	3.17½ –	3.92½
Acetic, 56%, bbl.	100 lb.	6.35 –	6.37
Glacial, 99½%, bbl.	100 lb.	12.05 –	12.85
Boric, bbl.	lb.	.11 –	.11½
Citric, kegs	lb.	.49 –	.50
Formic, 85%	lb.	.14½ –	.17
Gallic, tech.	lb.	.45 –	.50
Hydrofluoric, 52%, carboys	lb.	.12 –	.12½
Lactic, 44%, tech., light, bbl.	lb.	.11½ –	.12
22% tech., light, bbl.	lb.	.05½ –	.06
Muriatic, 18° tanks	100 lb.	.90 –	1.00
Muriatic, 20°, tanks,	100 lb.	1.00 –	1.10
Nitric, 36°, carboys	lb.	.04½ –	.05
Nitric, 42°, carboys	lb.	.06 –	.06½
Oleum, 20%, tanks	ton	18.50 –	19.00
Oxalic, crystals, bbl.	lb.	.13½ –	.13½
Phosphoric, 50% carboys	lb.	.07½ –	.08½
Pyrogallic, resublimed	lb.	1.50 –	1.60
Sulphuric, 60°, tanks	ton	9.00 –	10.00
Sulphuric, 60°, drums	ton	12.00 –	14.00
Sulphuric, 66°, tanks	ton	15.00 –	15.50
Sulphuric, 66° drums	ton	19.00 –	20.00
Tannic, U.S.P., bbl.	lb.	.65 –	.70
Tannic, tech., bbl.	lb.	.45 –	.50
Tartaric, imp. crys., bbl.	lb.	.35½ –	....
Tartaric, imp., powd., bbl.	lb.	.35½ –	....
Tartaric, domestic, bbl.	lb.	.36 –	....
Tungstic, per lb.	lb.	1.10 –	1.20
Alcohol, butyl, drums, f.o.b. works	lb.	.27 –	.29
Alcohol ethyl (Cologne spirit), bbl.	gal.	4.75 –	4.95
Alcohol, methyl (see Methanol)			
Alcohol, denatured, 188 proof No. 1, bbl.	gal.	.39 –	.40
Alum, ammonia, lump, bbl.	lb.	.03½ –	.03½
Potash, lump, bbl.	lb.	.03 –	.03½
Chrome, lump, potash, bbl.	lb.	.05½ –	.05½
Aluminum sulphate, com., bags	100 lb.	1.50 –	1.65
Iron free bags	lb.	.02½ –	.02½
Aqua ammonia, 26°, drums	lb.	.06½ –	.07½
Ammonia, anhydrous, cyl.	lb.	.30 –	.30½
Ammonium carbonate, powd. casks, imported	lb.	.09½ –	.10
Ammonium carbonate, powd. domestic, bbl.	lb.	.13 –	.14
Ammonium nitrate, tech., casks	lb.	.10 –	.11
Amyl acetate tech., drums	gal.	3.50 –	3.75
Arsenic, white, powd., bbl.	lb.	.15½ –	.16
Arsenic, red, powd., kegs	lb.	.14½ –	.15
Barium carbonate, bbl.	ton	78.00 –	80.00
Barium chloride, bbl.	ton	90.00 –	95.00
Barium dioxide, drums	lb.	.18 –	.18½
Barium nitrate, casks		.08 –	.08½
Barium sulphate, bbl.	lb.	.04 –	.04½
Blanc fixe, dry, bbl.	lb.	.04½ –	.04½
Blanc fixe, pulp, bbl.	ton	45.00 –	55.00
Bleaching powder, f.o.b. wks., drums	100 lb.	2.15 –	....
Spot N. Y. drums	100 lb.	2.60 –	2.70
Borax, bbl.	lb.	.05½ –	.05½
Bromine, cases	lb.	.28 –	.30
Calcium acetate, bags	100 lb.	3.50 –	3.60
Calcium carbide, drums	lb.	.04½ –	.04½
Calcium chloride, fused, drums	ton	22.00 –	23.00
Gran. drums	lb.	.01½ –	.01½
Calcium phosphate, mono, bbl.	lb.	.06½ –	.07
Camphor, cases	lb.	.88 –	.90
Carbon bisulphide, drums	lb.	.07 –	.07½
Carbon tetrachloride, drums	lb.	.10 –	....
Chalk, precip.—domestic, light, bbl.	lb.	.04½ –	.04½
Domestic, heavy, bbl.	lb.	.03½ –	.03½
Imported, light, bbl.	lb.	.04½ –	.05
Chlorine, liquid, cylinders	lb.	.06 –	.06½
Chloroform, tech., drums	lb.	.35 –	.38
Cobalt oxide, bbl.	lb.	2.10 –	2.25
Copperas, bulk, f.o.b. wks.	ton	16.50 –	20.00
Copper carbonate, bbl.	lb.	.19 –	.20
Copper cyanide, drums	lb.	.47 –	.50
Copper sulphate, crys., bbl., 100 lb.		6.25 –	6.50
Cream of tartar, bbl.	lb.	.25½ –	.26½
Epsom salt, dom., tech., bbl.	100 lb.	1.90 –	2.15
Epsom salt, imp., tech., bags	100 lb.	1.10 –	1.25
Epsom salt, U.S.P., dom., bbl.	100 lb.	2.50 –	2.60
Ether, U.S.P., drums	lb.	.13 –	.15
Ethyl acetate, com., 85%, drums	gal.	.80 –	.85
Ethyl acetate, pure (acetic ether, 98% to 100%)	gal.	.95 –	1.00
Formaldehyde, 40%, bbl.	lb.	.14½ –	.16
Fullers earth, f.o.b. mines	net ton	16.00 –	17.00
Fullers earth—imp., powd., net	ton	30.00 –	32.50
Fusel oil, ref., drums	gal.	3.55 –	4.05
Fusel oil, crude, drums	gal.	2.30 –	2.40
Glaubers salt, wks., bags	100 lb.	1.20 –	1.40
Glaubers salt, imp., bags	100 lb.	$1.00 –	$1.25
Glycerine, c.p., drums extra	lb.	.18 –	.18½
Glycerine, dynamite, drums	lb.	.16½ –	....
Iodine, resublimed	lb.	4.55 –	4.65
Iron oxide, red, casks	lb.	.12 –	.18
Lead:			
White, basic carbonate, dry, casks	lb.	.09½ –	.10
White, basic sulphate, casks	lb.	.09½ –	....
White, in oil, kegs	lb.	.12½ –	.14
Red, dry, casks	lb.	.11½ –	.12
Red, in oil, kegs	lb.	.13½ –	.15
Lead acetate, white crys., bbl.	lb.	.13½ –	.14
Brown, broken, casks	lb.	.12½ –	....
Lead arsenate, powd., bbl.	lb.	.23 –	.24
Lime-Hydrated, bbl.	per ton	16.80 –	17.00
Lime, Lump, bbl.	280 lb.	3.63 –	3.65
Litharge, comm., casks	lb.	.10½ –	.11
Lithophone, bags	lb.	.07 –	.07½
in bbl.	lb.	.07½ –	.07½
Magnesium carb., tech., bags	lb.	.08 –	.08½
Methanol, 95%, bbl.	gal.	1.21 –	1.23
Methanol, 97%, bbl.	gal.	1.23 –	1.25
Nickel salt, double, bbl.	lb.	.10½ –	....
Nickel salts, single, bbl.	lb.	.11½ –	....
Phosgene		.60 –	.75
Phosphorus, red, cases	lb.	.35 –	.40
Phosphorus, yellow, cases	lb.	.30 –	.35
Potassium bichromate, casks	lb.	.10½ –	.10½
Potassium bromide, gran., bbl.	lb.	.16½ –	.23
Potassium carbonate, 80-85%, calcined, casks	lb.	.06½ –	.07
Potassium chlorate, powd.	lb.	.07½ –	.08
Potassium cyanide, drums	lb.	.45 –	.50
Potassium, first sorts, cask	lb.	.09	.09½
Potassium hydroxide (caustic potash) drums	100 lb.	8.25 –	8.50
Potassium iodide, cases	lb.	3.65 –	3.75
Potassium nitrate, bbl.	lb.	.06½ –	.07½
Potassium permanganate, drums	lb.	.24 –	.24½
Potassium prussiate, red, casks	lb.	.80 –	.82
Potassium prussiate, yellow, casks	lb.	.37 –	.37½
Salammoniac, white, gran., casks, imported	lb.	.07 –	.07½
Salammoniac, white, gran., bbl., domestic	lb.	.07½ –	.08
Gray, gran., casks	lb.	.08 –	.09
Salsoda, bbl.	100 lb.	1.20	1.40
Salt cake (bulk)	ton	26.00 –	28.00
Soda ash, light, 58% flat, bags, contract	100 lb.	1.60 –	1.67
Soda ash, light, basis, 48%, bags, contract, f.o.b. wks.	100 lb.	1.20 –	1.30
Soda ash, light, 58%, flat, bags, resale	100 lb.	1.75 –	1.80
Soda ash, dense, bags, contract, basis 48%	100 lb.	1.17½ –	1.20
Soda ash, dense, in bags, resale	100 lb.	1.85 –	1.90
Soda, caustic, 76%, solid, drums, f.a.s.	100 lb.	3.45 –	3.50
Soda, caustic, basis 60%, wks., contract	100 lb.	2.50 –	2.60
Soda, caustic, ground and flake, contracts	100 lb.	3.80 –	3.90
Soda, caustic, ground and flake, resale	100 lb.	3.72½ –	....
Sodium acetate, works, bags	lb.	.05½ –	.06½
Sodium bicarbonate, bbl.	100 lb.	2.00 –	2.50
Sodium bichromate, casks	lb.	.07½ –	.08
Sodium bisulphate (niter cake)	ton	6.00 –	7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb.	.04½ –	.04½
Sodium chlorate, kegs	lb.	.06½ –	.07
Sodium chloride	long ton	12.00 –	13.00
Sodium cyanide, cases	lb.	.20 –	.23
Sodium fluoride, bbl.	lb.	$0.09½ –	$0.10
Sodium hyposulphite, bbl.	lb.	.02½ –	.03
Sodium nitrite, casks	lb.	.08½ –	.09
Sodium peroxide, powd., cases	lb.	.28 –	.30
Sodium phosphate, dibasic, bbl.	lb.	.03½ –	.04
Sodium prussiate, yel. drums	lb.	.17½ –	.18
Sodium silicate (40°, drums)	100 lb.	.80 –	1.25
Sodium silicate (60°, drums)	100 lb.	2.00 –	2.25
Sodium sulphide, fused, 60-62% drums	lb.	.04½ –	.04½
Sodium sulphite, crys., bbl.	lb.	.03½ –	.03½
Strontium nitrate, powd., bbl.	lb.	.09½ –	.10
Sulphur chloride, yel drums	lb.	.04½ –	.05
Sulphur, crude	ton	18.00 –	20.00
At mine, bulk	ton	16.00 –	18.00
Sulphur, flour, bbl.	100 lb.	2.35 –	3.15
Sulphur, roll, bbl.	100 lb.	2.00 –	2.50
Sulphur dioxide, liquid, cyl.	lb.	.08 –	.08½
Talc—imported, bags	ton	30.00 –	40.00
Talc—domestic powd., bags	ton	18.00 –	25.00
Tin bichloride, bbl.	lb.	.13½ –	.14
Tin oxide, bbl.	lb.	.52 –	.54
Zinc carbonate, bags	lb.	.14 –	.14½
Zinc chloride, gran, bbl.	lb.	.06 –	.07
Zinc cyanide, drums	lb.	.37 –	.38
Zinc oxide, , lead free, bbl.	lb.	.08 –	.08½
5% lead sulphate, bags	lb.	.07½ –	....
10 to 35 % lead sulphate, bags	lb.	.07 –	....
French, red seal, bags	lb.	.09½ –	....
French, green seal, bags	lb.	.10½ –	....
French, white seal, bbl.	lb.	.12 –	....
Zinc sulphate, bbl.	100 lb.	2.50 –	3.00

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.70 –	$0.80
Alpha-naphthol, ref., bbl.	lb.	.85 –	.95
Alpha-naphthylamine, bbl.	lb.	.36 –	.38
Aniline oil, drums	lb.	.16 –	.16½
Aniline salts, bbl.	lb.	.24 –	.25
Anthracene, 80%, imp., drums, duty paid	lb.	.75 –	1.00
Anthracene, 80%, imp., drums, duty paid	lb.	.70 –	.75
Anthraquinone, 25%, paste, drums	lb.	.70 –	.75
Benzaldehyde U.S.P., carboys	lb.	1.40 –	1.45
Benzene, pure, water-white, tanks and drums	gal.	.32 –	.35
Benzene, 90%, tanks & drums	gal.	.27 –	.30
Benzene, 90%, drums, resale	gal.	.30 –	.33
Benzidine base, bbl.	lb.	.85 –	.90
Benzidine sulphate, bbl.	lb.	.70 –	.75
Benzoic acid, U.S.P., kegs	lb.	.72 –	.75
Benzoate of soda, U.S.P., bbl.	lb.	.57 –	.65
Benzyl chloride, 95-97%, ref., drums	lb.	.25 –	.27
Benzyl chloride, tech., drums	lb.	.20 –	.23
Beta-naphthol, subl., bbl.	lb.	.55 –	.60
Beta-naphthol, tech., bbl.	lb.	.23 –	.23½
Beta-naphthylamine, tech.	lb.	.80 –	.90
Carbazol, bbl.	lb.	.75 –	.90
Cresol, U.S.P., drums	lb.	.25 –	.29
Ortho-cresol, drums	lb.	.24 –	.26
Cresylic acid, 97%, resale, drums	gal.	1.40 –	1.50
95-97%, drums, resale	gal.	1.30 –	1.30
Dichlorbenzene, drums	lb.	.07 –	.09
Diethylaniline, drums	lb.	.50 –	.60
Dimethylaniline, drums	lb.	.42 –	.43
Dinitrobenzene, bbl.	lb.	.19 –	.20
Dinitroclorbenzene, bbl.	lb.	.22 –	.23
Dinitronaphthalene, bbl.	lb.	.30 –	.32
Dinitrophenol, bbl.	lb.	.35 –	.40
Dinitrotoluene, bbl.	lb.	.20 –	.22
Dip oil, 25%, drums	gal.	.25 –	.30
Diphenylamine, bbl.	lb.	.50 –	.52
H-acid, bbl.	lb.	.85 –	....
Meta-phenylenediamine, bbl.	lb.	1.00 –	1.05
Michlers ketone, bbl.	lb.	3.00 –	3.50
Monochlorbenzene, drums	lb.	.08 –	.10
Monoethylaniline, drums	lb.	.95 –	1.10
Naphthalene, crushed, bbl.	lb.	.08 –	.09
Naphthalene, flake, bbl.	lb.	.09½ –	.10
Naphthalene, balls, bbl.	lb.	.10½ –	.11
Naphthionate of soda, bbl.	lb.	.58 –	.65
Naphthionic acid, crude, bbl.	lb.	.55 –	.60
Nitrobenzene, drums	lb.	.10 –	.12
Nitro-naphthalene, bbl.	lb.	.30 –	.35
Nitro-toluene, drums	lb.	.15 –	.17
N-W acid, bbl.	lb.	1.25 –	1.30
Ortho-amidophenol, kegs	lb.	2.30 –	2.35
Ortho-dichlorbenzene, drums	lb.	.17 –	.20
Ortho-nitrophenol, bbl.	lb.	.90 –	.92
Ortho-nitrotoluene, drums	lb.	.10 –	.12
Ortho-toluidine, bbl.	lb.	.14 –	.15
Para-amidophenol, base, kegs	lb.	1.20 –	1.30
Para-amidophenol, HCl, kegs	lb.	1.25 –	1.35
Para-dichlorbenzene, bbl.	lb.	.17 –	.20
Paranitraniline, bbl.	lb.	.74 –	.75
Para-nitrotoluene, bbl.	lb.	.60 –	.65
Para-phenylenediamine, bbl.	lb.	1.45 –	1.50
Para-toluidine, bbl.	lb.	.95 –	.98
Phthalic anhydride, bbl.	lb.	.35 –	.38
Phenol, U.S.P., drums	lb.	.55 –	.57
Picric acid, bbl.	lb.	.20 –	.22
Pyridine, dom., drums	gal.	nominal	
Pyridine, imp., drums	gal.	2.50 –	2.75

Resorcinol, tech., kegs	lb.	$1.40 –	$1.50
Resorcinol, pure, kegs	lb.	2.00 –	2.10
R-salt, bbl	lb.	.55 –	.60
Salicylic acid, tech., bbl	lb.	.47 –	.48
Salicylic acid, U.S.P., bbl	lb.	.50 –	.52
Solvent naphtha, water-white, drums	gal.	.37 –	.40
Crude, drums	gal.	.22 –	.24
Sulphanilic acid, crude, bbl	lb.	.18 –	.20
Thiocarbanilide, kegs	lb.	.35 –	.38
Toluidine, kegs	lb.	1.20 –	1.30
Toluidine, mixed, kegs	lb.	.30 –	.35
Toluene, tank cars	gal.	.30 –	.35
Toluene, drums	gal.	.35 –	.40
Xylidines drums	lb.	.45 –	.47
Xylene, pure, drums	gal.	.75 –	.85
Xylene, com., drums	gal.	.37 –	
Xylene, com., tanks	gal.	.32 –	

Naval Stores

Rosin B-D, bbl. 280 lb.		$6.15 –	
Rosin E-I, bbl. 280 lb.		6.25 –	
Rosin K-N, bbl. 280 lb.		6.30 –	6.60
Rosin W.G.-W.W., bbl. 280 lb.		6.80 –	7.80
Wood rosin, bbl. 280 lb.		6.20 –	
Turpentine, spirits of, bbl	gal.	1.47 –	1.48
Wood, steam dist., bbl	gal.	1.41 –	1.42
Wood, dest. dist., bbl	gal.	1.10 –	1.15
Pine tar pitch, bbl. 200 lb.		–	6.00
Tar, kiln burned, bbl. 500 lb.		–	12.00
Retort tar, bbl. 500 lb.		–	11.00
Rosin oil, first run, bbl	gal.	.45 –	
Rosin oil, second run, bbl	gal.	.48 –	
Rosin oil, third run, bbl	gal.	.52 –	
Pine oil, steam dist	gal.	.80 –	
Pine oil, pure, dest. dist	gal.	.75 –	
Pine tar oil, ref	gal.	.48 –	
Pine tar oil, crude, tanks f.o.b. Jacksonville, Fla	gal.	.31 –	.31½
Pine tar oil, double ref., bbl	gal.	–	.75
Pine tar, ref., thin, bbl	gal.	–	.25
Pinewood creosote, ref., bbl.	gal.	–	.52

Animal Oils and Fats

Degras, bbl	lb.	$0.03½ –	$0.04½
Grease, yellow, bbl	lb.	.08½ –	.08¾
Lard oil, Extra No. 1, bbl	gal.	.92 –	.94
Neatsfootoil, 20 deg. bbl	gal.	1.28 –	1.32
No. 1, bbl	gal.	.92 –	.94
Oleo Stearine		.10½ –	.10¾
Red oil, distilled, d.p. bbl	lb.	.11½ –	
Saponified, bbl	lb.	.11½ –	
Tallow, extra, loose	lb.	.09 –	
Tallow oil, acidless, bbl	gal.	.96 –	.98

Vegetable Oils

Castor oil, No. 3, bbl	lb.	$0.14 –	
Castor oil, No. 1, bbl	lb.	.14½ –	
Chinawood oil, bbl	lb.	.36 –	.38
Coconut oil, Ceylon, bbl	lb.	.10¼ –	.10½
Ceylon, tanks, N.Y	lb.	.09½ –	.09¾
Coconut oil, Cochin, bbl	lb.	.10¼ –	
Corn oil, crude, bbl	lb.	.12½ –	
Crude, tanks, (f.o.b. mill)	lb.	.10¼ –	.10½
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.10 –	.10½
Summer yellow, bbl	lb.	.12½ –	.12¾
Winter yellow, bbl	lb.	.13½ –	.13¾
Linseed oil, raw, car lots, bbl.	gal.	1.17 –	
Raw, tank cars (dom.)	gal.	1.12 –	
Boiled, cars, bbl. (dom.)	gal.	1.19 –	
Olive oil, denatured, bbl	gal.	1.15 –	
Sulphur, (foots) bbl	lb.	.10 –	.10½
Palm, Lagos, casks	lb.	.08½ –	
Niger, casks	lb.	.08¼ –	.08½
Palm kernel, bbl	lb.	.09¼ –	.09½
Peanut oil, crude, tanks (mill)	lb.	.13½ –	.14
Peanut oil, refined, bbl	lb.	.17 –	
Perilla, bbl	lb.	.16½ –	.16¾
Rapeseed oil, refined, bbl	gal.	.84 –	.85
Rapeseed oil, blown, bbl	gal.	.90 –	.91
Sesame, bbl	lb.	.13 –	.13½
Soya bean (Manchurian), bbl.	lb.	.12½ –	
Tank, f.o.b. Pacific coast	lb.	.10½ –	
Tank, (f.o.b. N.Y.)	lb.	.10½ –	.11

Fish Oils

Cod, Newfoundland, bbl	gal.	$0.68 –	$0.70
Menhaden, light pressed, bbl.	gal.	.76 –	
White bleached, bbl	gal.	.78 –	
Blown, bbl	gal.	.82 –	
Crude, tanks (f.o.b. factory)	gal.	.50 –	
Whale No. 1 crude, tanks, coast	lb.	.06½ –	
Winter, natural, bbl	gal.	.76 –	.78
Winter, bleached, bbl	gal.	.79 –	.80

Oil Cake and Meal

Coconut cake, bags	ton	$33.00 –	
Copra, sun dried, bags, (c.i.f.)	lb.	.05½ –	
Sun dried Pacific coast	lb.	.05½ –	
Cottonseed meal, f.o.b. mills	ton	39.00 –	40.00
Linseed cake, bags	ton	36.00 –	
Linseed meal, bags	ton	38.00 –	

Dye & Tanning Materials

Albumen, blood, bbl	lb.	$0.45 –	$0.50
Albumen, egg, tech, kegs	lb.	.80 –	.85
Cochineal, bags	lb.	.35 –	.36
Cutch, Borneo, bales	lb.	.04½ –	.05
Cutch, Rangoon, bales	lb.	.13 –	.13½
Dextrine, corn, bags 100 lb.		3.54 –	3.59
Dextrine, gum, bags 100 lb.		3.89 –	3.99
Divi-divi, bags	ton	38.00 –	39.00
Fustic, sticks	ton	30.00 –	35.00
Fustic, chips, bags	lb.	.04 –	.05
Logwood, sticks	ton	28.00 –	30.00
Logwood, chips, bags	lb.	.02½ –	.03¼
Sumac, leaves, Sicily, bags	ton	$70.00 –	$72.00
Sumac, ground, bags	ton	65.00 –	67.00
Sumac, domestic, bags	ton	40.00 –	42.00
Tapioca flour, bags	lb.	.05½ –	.06¼

Extracts

Archil, conc., bbl	lb.	$0.17 –	$0.18
Chestnut, 25% tannin, tanks	lb.	.02 –	.03
Divi-divi, 25% tannin, bbl	lb.	.04 –	.05
Fustic, crystals, bbl	lb.	.20 –	.22
Fustic, liquid, 42°, bbl	lb.	.08 –	.09
Gambier, liq., 25% tannin, bbl.	lb.	.08 –	.09
Hematine crys., bbl	lb.	.14 –	.18
Hemlock, 25% tannin, bbl	lb.	.04 –	.05
Hypernic, solid, drums	lb.	.24 –	.26
Hypernic, liquid, 51°, bbl	lb.	.14 –	.17
Logwood, crys., bbl	lb.	.19 –	.20
Logwood, liq., 51°, bbl	lb.	.09 –	.10
Quebracho, solid, 65% tannin, bbl	lb.	.04½ –	.05
Sumac, dom., 51°, bbl	lb.	.06½ –	.07

Dry Colors

Blacks–Carbongas, bags, f.o.b. works	lb.	$0.16 –	$0.18
Lampblack, bbl	lb.	.12 –	.40
Mineral, bulk	ton	35.00 –	45.00
Blues–Bronze, bbl	lb.	.55 –	.60
Prussian, bbl	lb.	.55 –	.60
Ultramarine, bbl	lb.	.08 –	.35
Browns, Sienna, Ital., bbl	lb.	.06 –	.14
Sienna, Domestic, bbl	lb.	.03½ –	.04
Umber, Turkey, bbl	lb.	.04 –	.04½
Greens–Chrome, C.P. Light, bbl	lb.	.32 –	.34
Chrome, commercial, bbl	lb.	.12 –	.12½
Paris, bulk	lb.	.30 –	.35
Reds, Carmine No. 40, tins	lb.	4.50 –	4.70
Oxide red, casks	lb.	.10 –	.14
Para toner, kegs	lb.	1.00 –	1.10
Vermilion, English, bbl	lb.	1.30 –	1.32
Yellow, Chrome, C.P. bbls	lb.	.20 –	.21
Ocher, French, casks	lb.	.02½ –	.03

Waxes

Bayberry, bbl	lb.	$0.28 –	$0.30
Beeswax, crude, bags	lb.	.21 –	.25
Beeswax, refined, light, bags	lb.	.32 –	.34
Beeswax, pure white, cases	lb.	.40 –	.41
Candellila, bags	lb.	.24 –	.25
Carnauba, No. 1, bags	lb.	.42 –	.43
No. 2, North Country, bags	lb.	.23 –	.23½
No. 3, North Country, bags	lb.	.19½ –	
Japan, cases	lb.	.14½ –	.15
Montan, crude, bags	lb.	.04½ –	.04¾
Paraffine, crude, match, 105-110 m.p.	lb.	.04½ –	.04¾
Crude, scale 124-126 m.p., bags	lb.	.03 –	.03½
Ref., 118-120 m.p., bags	lb.	.03½ –	
Ref., 125 m.p., bags	lb.	.03½ –	
Ref. 128-130 m.p., bags	lb.	.04½ –	.04¾
Ref., 133-135 m.p., bags	lb.	.04½ –	
Ref., 135-137 m.p., bags	lb.	.05½ –	.05¾
Stearic acid, sgle pressed, bags	lb.	.14 –	
Double pressed, bags	lb.	.14½ –	
Triple pressed, bags	lb.	.16 –	

Fertilizers

Ammonium sulphate, bulk, f.o.b. works 100 lb.		$3.25 –	$3.30
F.a.s. double bags 100 lb.		3.90 –	4.00
Blood, dried, bulk	unit	4.50 –	
Bone, raw, 3 and 50, ground	ton	27.00 –	30.00
Fish scrap, dom., dried, wks.	unit	3.75 –	10.00
Nitrate of soda, bags 100 lb.		2.62½ –	2.65
Tankage, high grade, f.o.b. Chicago unit		4.25 –	4.50
Phosphate rock, f.o.b. mines, Florida pebble, 68-72%	ton	$4.00 –	$4.50
Tennessee, 78-80%	ton	8.00 –	8.25
Potassium muriate, 80%, bags	ton	35.00 –	36.00
Potassium sulphate, bags basis 90%	ton	45.67 –	

Crude Rubber

Para—Upriver fine	lb.	$0.28½ –	
Upriver coarse	lb.	.26½ –	
Upriver caucho ball	lb.	.27½ –	
Plantation—First latex crepe	lb.	.32½ –	
Ribbed smoked sheets	lb.	.32½ –	
Brown crepe, thin, clean	lb.	.30½ –	
Amber crepe No. 1	lb.	.32 –	

Gums

Copal, Congo, amber, bags	lb.	$0.18½ –	$0.19
East Indian, bold, bags	lb.	.22 –	.23
Manila, pale, bags	lb.	.21 –	.22
Pontinak, No. 1 bags	lb.	.21 –	.22
Damar, Batavia, cases	lb.	.31 –	.31½
Singapore, No. 1, cases	lb.	.34½ –	.35
Kauri, No. 1, cases	lb.	.62 –	.66
Ordinary chips, cases	lb.	.18 –	.20
Manjak, Barbados, bags	lb.	.09 –	.09½

Shellac

Shellac, orange fine, bags	lb.	$0.76 –	
Orange superfine, bags	lb.	.78 –	
A. C. garnet, bags	lb.	.76 –	
Bleached, bonedry	lb.	.86 –	
Bleached, fresh	lb.	.75 –	
T. N., bags	lb.	.72 –	.74

Miscellaneous Materials

Asbestos, crude No. 1, f.o.b., Quebec sh. ton		$500.00 –	
Asbestos, shingle, f.o.b., Quebec sh. ton		$65.00 –	$85.00
Asbestos, cement, f.o.b., Quebec sh. ton		20.00 –	25.00
Barytes, grd., white, f.o.b. mills, bbl. net ton		16.00 –	20.00
Barytes, grd., off-color, f.o.b. mills bulk net ton		13.00 –	15.00
Barytes, floated, f.o.b. St. Louis, bbl net ton		28.00 –	
Barytes, crude f.o.b. mines, bulk net ton		10.00 –	11.00
Casein, bbl., tech lb.		.23 –	.25
China clay (kaolin) crude, f.o.b. Ga net ton		7.00 –	9.00
Washed, f.o.b. Ga net ton		8.00 –	9.00
Powd., f.o.b. Ga net ton		13.00 –	20.00
Crude f.o.b. Va net ton		8.00 –	12.00
Ground, f.o.b. Va net ton		13.00 –	20.00
Imp., lump, bulk net ton		15.00 –	20.00
Imp., powd net ton		45.00 –	50.00
Feldspar, No. 1 pottery long ton		6.00 –	7.00
No. 2 pottery long ton		5.00 –	5.50
No. 1 soap long ton		7.00 –	7.50
No. 1 Canadian, f.o.b. mill long ton		25.00 –	27.00
Graphite, Ceylon, lump, first quality, bbl lb.		.06 –	.06½
Ceylon, chip, bbl lb.		.05 –	.05½
High grade amorphous crude ton		35.00 –	50.00
Gum arabic, amber, sorts, bags lb.		.15 –	.16
Gum tragacanth, sorts, bags lb.		.50 –	.60
No. 1, bags lb.		1.75 –	1.80
Kieselguhr, f.o.b. Cal ton		40.00 –	42.00
F.o.b. N. Y ton		50.00 –	55.00
Magnesite, crude, f.o.b. Cal ton		14.00 –	15.00
Pumice stone, imp., casks lb.		.03 –	.05½
Dom., lump, bbl lb.		.05 –	.05½
Dom., ground, bbl lb.		.06 –	.07
Silica, glass sand, f.o.b. Ind ton		2.00 –	2.50
Silica, sand blast, f.o.b. Ind ton		2.50	5.00
Silica, amorphous, 250-mesh, f.o.b. Ill ton		17.00 –	17.50
Silica, bldg. sand, f.o.b. Pa ton		2.00 –	2.75
Soapstone, coarse, f.o.b. Vt., bags ton		7.00 –	8.00
Talc, 200 mesh, f.o.b., Vt., bags ton		6.50 –	9.00
Talc, 200 mesh, f.o.b. Ga., bags ton		7.00 –	9.00
Talc, 200 mesh, f.o.b. Los Angeles, bags ton		16.00 –	20.00

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$3.75 –	
Corning	bbl.	2.15 –	
Cabell	bbl.	2.41 –	
Somerset	bbl.	2.20 –	
Illinois	bbl.	2.37 –	
Indiana	bbl.	2.38 –	
Kansas and Oklahoma, 28 deg.	bbl.	1.50 –	$1.60
California, 35 deg. and up	bbl.	1.04 –	

Gasoline, Etc.

Motor gasoline, steel bbls	gal.	$0.24½ –	
Naphtha, V. M. & P. devd, steel bbls	gal	.23½ –	
Kerosene, ref. tank wagon	gal.	.15 –	
Bulk, W. W. export	gal.	.08 –	
Lubricating oils:			
Cylinder, Penn., dark	gal.	.27 –	.30
Bloomless, 30@31 grav	gal.	.20 –	.22
Paraffin, pale	gal.	.24 –	.25
Spindle, 200, pale	gal.	.25 –	.26
Petrolatum, amber, bbls	lb.	.05 –	.05½
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	ton	$45–50
Chrome brick, f.o.b. Eastern shipping points	ton	50–52
Chrome cement, 40-50% Cr_2O_3	ton	23–27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks	1,000	40–46
2nd. quality, 9-in. shapes, f.o.b. wks	1,000	36–41
Magnesite brick, 9-in. straight (f.o.b. wks.)	ton	65–68
9-in. arches, wedges and keys	ton	80–85
Scraps and splits	ton	85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	48–50
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000	48–50
F.o.b. Mt. Union, Pa	1,000	42–44
Silicon carbide refract. brick, 9-in.	1,000	1,100.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N. Y.	ton	$200.00 –	$225.00
Ferrochromium, per lb. of Cr, 6-8% C	lb.	.11½	.11¾
4-6% C	lb.	.12 –	.13
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	120.00 –	
Spiegeleisen, 19-21% Mn	gr. ton	40.00 –	
Ferromolybdenum, 50-60% Mo, per lb. Mo	lb.	1.90 –	2.15
Ferrosilicon, 10-15%	gr. ton	38.00 –	40.00
50%	gr. ton	86.00 –	89.00
75%	gr. ton	150.00 –	160.00

Ferrotungsten, 70-80%, per lb. of W	lb.	$0.85 –	$0.90
Ferro-uranium, 35-50% of U. per lb. of U	lb.	6.00 –	.....
Ferrovanadium, 30-40%, per lb. of V	lb.	3.75 –	4 00

Ores and Semi-finished Products

Bauxite, dom. crushed, dried, f.o.b. shipping points	ton	$6.50 –	$8.75
Chrome ore Calif. concentrates, 50% min. Cr_2O_3.	ton	22.00 –	23.00
C.i.f. Atlantic seaboard	ton	21.00 –	24 00
Coke, fdry., f.o.b. ovens	ton	7.50 –	8 00
Coke, furnace, f.o.b. ovens	ton	6.00 –	6.50
Fluorspar, gravel, f.o.b. mines' Illinois	ton	19.00 –	21.00
Ilmenite, 52% TiO_2	lb.	.01½–	.01¾
Manganese ore, 50% Mn, c.i.f. Atlantic seaport	unit	.33 –	.....
Manganese ore, chemical (MnO_2)	ton	75.00 –	80.00
Molybdenite, 85% MoS_2, per lb. MoS_2, N. Y.	lb.	.65 –	.70
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 –	.08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½–	.12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.11½–	.12
Pyrites, dom. fines, f.o.b. mines, Ga	unit	.12	
Rutile, 95% TiO_2	lb.	.12 –	.....
Tungsten, scheelite, 60% WO_3 and over, per unit WO_3	unit	8.50 –	8.75
Tungsten, wolframite, 60% WO_3 and over, per unit WO_3	unit	8.00 –	8.25
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 –	3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	2.25 –	2.50
Vanadium pentoxide, 99%	lb.	12.00 –	14.00
Vanadium ore, per lb. V_2O_5	lb.	1.00 –	.....
Zircon, washed, iron free, f.o.b. Pablo, Fla	lb.	.04½–	.13

Non-Ferrous Materials

	Cents per Lb.
Copper, electrolytic	16½–16¾
Aluminum, 98 to 99%	23–24
Antimony, wholesale, Chinese and Japanese	8½– 9
Nickel, virgin metal	28–30
Nickel, ingot and shot	30–
Monel metal, shot and blocks	32.00
Monel metal, ingots	38.00
Monel metal, sheet bars	45.00
Tin, 5-ton lots, Straits	45.00
Lead, New York, spot	8.00
Lead, E. St. Louis, spot	7.95
Zinc, spot, New York	7.55
Zinc, spot, E. St. Louis	7.20

Other Metals

Silver (commercial)	oz.	$0.66¾
Cadmium	lb.	1.10
Bismuth (500 lb. lots)	lb.	2.55
Cobalt	lb.	2.65@2.85
Magnesium, ingots, 99%	lb.	1.25–
Platinum	oz.	115.00
Iridium	oz.	260.00@275.00
Palladium	oz.	79.00
Mercury	75 lb.	69.00–

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	25.50
Copper bottoms	30.75
Copper rods	25.25
High brass wire	19.50
High brass rods	17.00
Low brass wire	21.10
Low brass rods	22.00
Brazed brass tubing	24.25
Brazed bronze tubing	29.00
Seamless copper tubing	25.25
Seamless high brass tubing	23.50

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

Copper, heavy and crucible	11.30@11.50
Copper, heavy and wire	11 25@11.50
Copper, light and bottoms	9.25@ 9.50
Lead, heavy	5.75@ 6.00
Lead, tea	3.50@ 3.75
Brass, heavy	6.25@ 6.40
Brass, light	5.35@ 5.75
No. 1 yellow brass turnings	6.30@ 6.50
Zinc	3.50@ 4.00

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	$3.29	$3.14
Soft steel bars	3.19	3.04
Soft steel bar shapes	3.19	3.04
Soft steel bands	3.29	3.19
Plates, ¼ to 1 in. thick	3.29	3.14

Industrial

Financial, Construction and Manufacturing News

Industrial Developments

RUBBER—The Lee Tire & Rubber Co., Conshohocken, Pa., has advanced manufacture to a capacity schedule of 2,500 tires a day, and will continue on this basis for an indefinite period.

The Manhattan Rubber Mfg. Co., Passaic, N. J., manufacturer of mechanical rubber products, is maintaining capacity operations at its mill, and has advanced the wages of employees 10 per cent, effective April 1.

The Allentown Leather & Belting Co., Allentown, Pa., recently organized, has commenced production at its new local plant and plans to develop capacity at an early date. Additional workers will be added to the force.

The McGraw Tire & Rubber Co., East Palestine, O., has suspended operations and notified the working force, totaling 2,500 persons, that it is indefinite when the plant will reopen. Operations have been on a part-time basis for several weeks past.

The New York Belting & Packing Co., Passaic, N. J., is operating at maximum at its local mills, and will continue on this basis for some time to come. Employees have been given a wage advance of 10 per cent.

The Kelly-Springfield Tire Co., Cumberland, Md., is running full at its new local mill, as well as at its smaller plant at Akron, O., with gross output at the two plants of 7,000 tires a day, or about 50 per cent in excess of the figures at this time a year ago.

The Goodyear Tire & Rubber Co., Akron, O., is producing on an average of 30,000 to 30,500 tires per day, giving employment to a working force of 13,300 persons. This compares with a production record in April, 1920, two years ago, of 35,780 tires a day, with a working force of 33,257 persons, showing the present greater plant and labor efficiency. The operatives are now working on a 10 per cent bonus plan, recently adopted.

GLASS—Flint glass manufacturers in the vicinity of Millville, N. J., are holding to full capacity, with greatest available working forces. There will be no compulsory shut-down this year, in accordance with agreement with operatives, and the only curtailment anticipated for months to come will be caused by necessary equipment repairs.

The Illinois Glass Co., Chicago, Ill., is said to be negotiating for the sale of its plant at Minotola, N. J., recently abandoned for a new and larger plant in a neighboring district. It is expected that the local factory will be reopened at an early date.

All sheet glass and window glass plants in western Pennsylvania are holding to maximum production schedules and every effort is being made to secure additional labor. The mills will continue on the present basis for a number of months to come.

The Pennsylvania Glass Sand Co., Hancock, Md., has resumed full operations at its plant, following a brief suspension caused by a strike of about 50 of the men, who demanded a flat wage advance of $1 a day. The company has agreed to an increase of 50 cents, and this has been accepted by the operatives.

CEMENT—All mills in the Lehigh Valley district, Pennsylvania, are continuing under maximum production schedules, and giving employment to all available men. A call is out for more operatives, and advanced wage scales have been adopted to attract workers. The Lehigh Portland Cement Co., New Castle, has announced an increase of 10 per cent, affecting about 800 men at the local mills. The Atlas Portland Cement Co., Northampton, has made a similar advance. The other smaller mills are expected to follow before the close of the month.

The Riverside Portland Cement Co., Riverside, Calif., is running under a heavy production schedule at its plant with full working force. This schedule will be continued indefinitely.

MISCELLANEOUS—The Grasselli Chemical Co. has advanced production at its plant at Grasselli, near Elizabeth, N. J., increasing the working hours from 9 to 9½ hours per day. Wages have also been advanced 3 cents an hour. The plant is giving employment to about 1,500 operatives.

The American Powder Mills, Inc., Concord, N. H., is giving employment to approximately 150 persons at its black powder and smokeless powder plants, on a full time basis. Wages have been advanced 20 per cent, effective at once.

Employees at the plant of the Long Valley Paint Co., Hancock, near Reading, Pa., have declared a strike, with demand for increased wages. The plant has been compelled to curtail production, pending a settlement.

The Diamond State Fiber Co., Bridgeport, Pa., is giving employment to more than 1,000 operatives on a full-time basis, and will maintain production at this basis for an indefinite period. Wages have recently been increased 5 cents an hour, or 50 cents a day.

Construction and Operation

Alabama

PELL CITY—The Anniston Refractories Co., Anniston, has plans for the construction of a new plant on local site for the manufacture of firebrick and refractory shapes. Six kilns will be built.

California

SAN FRANCISCO—The Glidden Co., Madison Ave., N. W., Cleveland, O., manufacturer of paints, varnishes, etc., has acquired the plant of the Natoma Rice Mills, Hubbel St., near 16th St., for a consideration of $300,000, and will remodel and improve the factory for a new branch works. The structure is 4-story, totaling 50,000 sq.ft. of space, and equipment will be installed to give employment to about 150 operatives.

RIVERSIDE—The Snowolene Refining Co., Pacific Mutual Bldg., Los Angeles, with plant at Florence Ave. and Alameda St., that city, is negotiating for a site at Riverside for the construction of a gasoline-refining plant, to be equipped for a handling capacity of 1,000 bbl. of crude oil per day. It is estimated to cost $300,000, with machinery. F. E. Snowden and Ralph Arnold head the company.

COALINGA—The Mohawk Oil Co., recently organized to take over the plants and properties of the Coalinga-Mohawk Oil Co. and the Continental Refining Co., has plans for the construction of a new refining plant in the Santa Fe Springs district. A bond issue of $500,000 has been sold to defray the cost. Alfred L. Meyerstein is president.

SAN DIEGO—Elbert M. Vail, president of the California Chemical Co., and Stanley H. Barrows, president of the National Kellestone Co., are planning for the joint erection of a new plant on local site for the manufacture of an oxychloride cement, produced under a special chemical process. It will cost approximately $60,000.

SISSON—J. F. Mackey, formerly connected with the Kaiser Construction Co., has organized a company to operate a local plant for the manufacture of cement and concrete products.

VENTURA—The Seaside Refinery Co. has acquired a local site of 8 acres, for the erection of a new oil-refining plant, to cost about $80,000, with equipment. It will be designed to handle light oils only.

Florida

JACKSONVILLE—The Non-Acid Fertilizer & Chemical Co., Lakeland, Fla., is perfecting plans for the erection of a new branch plant here to cost approximately $85,000, with machinery. The company will also increase the capacity of its main works at Lakeland. C. W. Deen is president.

Illinois

CHICAGO—The Midwest Sugar Refining Co., recently organized, has acquired the beet sugar and glucose mills of Charles Pope, Riverdale, near Chicago, with adjoining tract of 14 acres of land. Plans are in preparation for remodeling the existing works, to include the installation of additional machinery, estimated to cost $125,000. A second plant unit will also be built at an early date, with capacity of 50,000 tons per annum, estimated to cost $1,000,000, with machinery. The plant will be arranged to refine both cane and beet sugars. Theodore W. Bunte, head of Bunte Brothers, 730 West Munroe St., confectioners, is president of the new company.

Louisiana

NEW ORLEANS—The Amalgamated Seaport Petroleum Co., organized with a capital of $25,000,000, has acquired a tract of land on the Mississippi River, near the city, and plans for the construction of a large oil refinery. Plans for the first unit are being prepared; it is estimated to cost $1,500,000, with machinery.

Maryland

BALTIMORE—The Baltimore Paint & Color Works, Inc., Frederick and Calverton Rds., will soon commence the rebuilding of the portion of its plant destroyed by fire April 11, with loss estimated at $50,000. Albert A. Shuger is general manager.

Massachusetts

EAST BOSTON—The Acme White Lead & Color Works, Inc., 266 Border St., plans for the early rebuilding of the portion of its plant destroyed by fire, April 6, with loss approximating $65,000, including equipment

FALL RIVER—The E. S. Park's Shellac Co., South Main and Oliver Sts., will erect a new 1-story building at its plant, 50x100 ft., to cost about $20,000.

New Jersey

ARLINGTON—E. I. du Pont de Nemours & Co., Forest St., will commence the construction of a new fume stack at the nitration house at its local plant, to replace a stack recently destroyed.

CARTARET—The Cartaret Oil & Refining Co. has plans for an addition to its local oil storage and distributing plant.

New York

BUFFALO—The Federal Concrete Co. Inc., has commenced excavations for a new plant on property recently acquired at Wyoming and Kensington Aves., for the manufacture of cement and concrete products. It will consist of a number of buildings with main structure 85x110 ft., estimated to cost $35,000. W. E. Jones is president.

Ohio

WARREN—The Trumbull-Cliffs Furnace Co. will construct a battery of 47 byproduct coke ovens, Koppers type, with an auxiliary plant for gas and tar recovery, and for the production of benzol and ammonia sulphate. The project is estimated to cost $3,000,000, and bonds for this amount have been sold. William G. Mather is president.

AKRON—Plans have been completed for the construction of a plant for the production of alum for use at the municipal filtration plant to be equipped for a capacity of approximately 1,000 tons a year. M. P. Tucker is city manager, in charge.

Oklahoma

ARDMORE—The Pure Oil Co., Pure Oil Bldg., Columbus, O., will make extensions and improvements at its local oil-refining plant, including the installation of new process stills and other equipment, estimated to cost $250,000.

TULSA—The Roxana Petroleum Corp., Roxana, Ill., operating a local plant, has acquired a tract of 200 acres of land near Wichita, Kan., as a site for a new refining plant, to be equipped to handle 10,000 bbl. of crude oil per day. It is estimated to cost $3,500,000, with machinery.

WYNNEWOOD—The Texas-Pacific Coal & Oil Co. has construction under way on a new oil refining plant, and will soon commence the installation of machinery.

GUTHRIE—The Pioneer Petroleum Co. has work in progress on extensions and improvements to the oil refinery of the Carbo Refining Co., recently acquired, and will install considerable additional equipment.

Pennsylvania

SPRINGDALE—The Heidenkamp Plate Glass Corp., recently organized to acquire the local plant and business of the company of the same name, has plans in progress for the construction of a number of new buildings to increase the capacity about 50 per cent. The expansion is estimated to cost close to $1,000,000, and bonds for this amount have been sold. Frank E. Troutman is vice-president and general manager.

PHILADELPHIA—The W. J. McCahan Sugar Refining & Molasses Co., Foot of Tasker St., has commenced the construction of an addition to its sugar refinery, estimated to cost about $425,000. To carry out this project and other expansion, the company is disposing of preferred stock for $1,767,000. H. B. Young is secretary.

Tennessee

NASHVILLE—The Bon Air Chemical Co., recently organized with a capital of $1,000,000, has tentative plans under way for the erection of a new plant on local site. M. P. O'Connor heads the company.

CHATTANOOGA—The Chattanooga-Burdett Oxygen Co., 1270 Market St., manufacturer of industrial oxygen products, has plans in progress for the erection of an addition to its plant in the Alton Park section to double, approximately, the present output. It is estimated to cost $100,000. W. K. Hendricks is general manager.

KNOXVILLE—W. G. Lowe & Co., manufacturer of leather products, are planning for the erection of a new 2-story plant, 35 x 125 ft., to cost about $30,000.

Texas

FORT WORTH—The Southwestern Portland Cement Co., El Paso, has acquired a tract of land on Sycamore Creek, near Fort Worth, as a site for a new cement mill. The initial plant will have a capacity of approximately 3,000 bbl. per day, and is estimated to cost close to $500,000.

HOUSTON—The Texas Co., Houston, and 17 Battery Pl., New York, has preliminary plans in progress for the construction of new units at its refining plants at Port Arthur and Port Neches, Tex., for large increase in production. The project will be carried out in conjunction with similar expansion at other refineries of the company at West Tulsa, Okla.; Casper, Wyo.; and Lockport, Ill., during the coming months. A fund of $10,000,000 has been arranged for the entire expansion.

ACME—The Certain-teed Products Corp., St. Louis, Mo., is planning for extensions in the local plant of the Acme Cement Plaster Co., utilizing gypsum deposits in this district. The Acme company was recently acquired for a consideration said to be in excess of $2,000,000, including mills in other parts of the country. It is purposed to increase the output of the local plant with the installation of considerable machinery.

MANCHESTER—The Texas Portland Cement Co., Dallas, has commenced the erection of additions to its local mill to increase the annual output to an 800,000-bbl. rating. Considerable additional machinery will be installed. The work will cost in excess of $150,000.

CADDO—The Mid-Kansas Oil Co., has plans for the rebuilding of the portion of its gasoline-refining plant, recently destroyed by fire with loss estimated at $50,000.

Vermont

RUTLAND—The Rutland Evaporator Co. has tentative plans for the rebuilding of the portion of its plant, destroyed by fire, April 1, with loss estimated at $40,000.

Washington

VANCOUVER—The Columbia River Paper Mills Corp., will break ground at once for the first unit of its proposed local mill. The entire plant, with machinery, is estimated to cost in excess of $1,000,000.

West Virginia

FAIRMONT—The Dixie Co., has commenced the construction of a new 2-story oil refining plant, 50x100 ft. A laboratory will be installed.

KENOVA—The Basic Products Co., has perfected plans for the erection of a new plant addition to be equipped for the production of lime for construction service. It is planned to have the unit ready for use early in the summer.

Canada

MONTREAL, QUE.—The National Cement Co., recently organized with a capital of $4,000,000, has plans in progress for the construction of a new cement mill on site purchased near the St. Lawrence River, to consist of a number of units, estimated to cost in excess of $1,000,000. Work will be commenced in about 60 days. Isaie Laplante, Fall River, Mass., is president, and Edmond Cote, of the same city, treasurer and general manager.

New Companies

HERMAN CHEMICAL CO. OF NEW JERSEY, Jersey City; chemicals and chemical byproducts; $25,000. Incorporators: C. F. Reynolds, M. Goodman and S. Wormser. Representative: Frank J. Higgins, 15 Exchange Place, Jersey City.

MODERN DYE & CHEMICAL CO., 212 Union St., Providence, R. I., organized; chemicals and dyestuffs. George Decker heads the company.

CITIES SERVICE OIL CO., 208 South La Salle St., Chicago, Ill.; refined oils; $250,000. Incorporators: Austin H. Smith, A. Karvatt and L. K. Edmondson.

TOLU FLUORSPAR CO., Evansville, Ind.; fluorspar and kindred products, capital, $50,000. Incorporators: James F. Engle, Charles H. Parsons and Mark N. Foley, all of Evansville.

CATO TIRE & RUBBER CO., Anniston, Ala.; rubber products; $95,000. J. W. Cato, president; and W. W. Stansell, secretary-treasurer, both of Anniston.

SCHAFFER-ALLESS CHEMICAL CO., Pittsburgh, Pa.; chemicals and chemical byproducts; $100,000. Incorporators: John C. Schaffer, A. F. Cooke and Albert H. Alless, Jr., Pittsburgh. Representative: Capital Trust Co. of Delaware, Dover, Del.

WEST DISINFECTING CO., Dallas, Tex.; chemicals; $10,000. Incorporators: M. B. and I. J. Marcuse, both of Dallas.

WALSH CHEMICAL CO., St. Louis, Mo.; chemicals and chemical byproducts; $100,000. Incorporators: J. D. Poe, M. Walsh and A. G. Kirschbaum, all of St. Louis.

PONTIAC CEMENT PRODUCTS CO., Pontiac, Mich.; cement; $50,000. Incorporators: W. J. Hogan, M. A. Benson and H. A. Freeman, 22 Lexington Place, Pontiac.

EL TEJANO OIL CO., Boston, Mass.; refined petroleum products; $500,000. John A. Sullivan, president; and Arthur J. Lawrence, treasurer, 265 Newbury St., Boston.

REINEAU PROCESS CO., INC., Essex and Middlesex Turnpike, Elizabeth, N. J.; fertilizers and chemicals. Incorporators: Francis T. White, H. H. A. Meyn and Thomas McEerlean.

FLYNT PAINT & VARNISH CO., Cleveland, O.; paints, varnish, oils, etc.; $10,000. Incorporators: Wilton B. Flynt, Jr., and W. H. Kasson, both of Cleveland.

MARTIN CHEMICAL CO., INC., Brooklyn, N. Y.; chemicals and chemical byproducts; $10,000. Incorporators: M. and J. Mariella, and G. Disalvo. Representative: H. Lee, 36 West 44th St.

W. H. METZGER CO., INC., 914 South Main St., Bloomington, Ill.; insecticides and chemical compositions; $19,000. Incorporators: W. H. Metzger, Thomas S. Weldon and W. D. Alexander.

WALLACE & TIERNAN PANDO CO., Belleville, N. J.; chemicals and chemical byproducts; $25,000. Incorporators: J. C. Baker, Gerald D. Peet and William J. Orchard, 11 Mill St.

ROSS SEGUNDA OIL CO., Laredo, Tex.; petroleum products; $150,000. Incorporators: W. C. Bobb, J. F. Ross and T. C. Mann, all of Laredo.

UNITED STATES LIQUID RUBBER PAINT CO., New York, N. Y.; special paints and varnishes; $1,000,000. Incorporators: Samuel Waxman, J. A. Lehman and Sidney B. Klee. Representative: Arley B. Magee, Dover, Del.

LEATHER DYES MFG. CO., 408-10 Adams St., Newark, N. J., organized; dyes and chemicals. John O. Pilar heads the company.

NEW ENGLAND OIL, PAINT & VARNISH CO., Boston, Mass.; paints, varnishes, etc.; 1,000 shares of stock, no par value. Lyford A. Merrow, president; Herbert O. Brackett, Reading, Mass., treasurer and representative.

SPARKS RUBBER CO., Philadelphia, Pa.; rubber products; $25,000. H. L. Jenkins, Devon, Pa., treasurer and representative.

N. S. M. RESEARCH CORP., New York, N. Y.; chemicals; $10,000. Incorporators:

F. K. Fairchild, W. H. Smith and H. G. Samson. Representative: Kelly & Blinn, 200 Broadway.

SOUTHERN PORTLAND CEMENT CO., Wilmington, Del.; cement, $6,000,000. Representative: Corporation Trust Co. of America, du Pont Bldg., Wilmington.

DAVID H. TIFFANY CORP., Rochester, N. Y.; tires and other rubber products; $50,000. Incorporators: D. H. and H. R. Tiffany, and G. A. Fritsche. Representative: E. C. Redfern, Insurance Bldg., Rochester.

HUGHES & CO., INC., 910 South Michigan Ave., Chicago, Ill.; petroleum products; $50,000. Incorporators: Ernest L. Hughes, J. E. Hauronic and F. P. Page.

HOME PAINT CO., INC., Birmingham, Ala.; paints and varnishes; $25,000. Incorporators: C. R. Barrett, Howe C. Benson and K. G. Smith, all of Birmingham.

PRATT-HEWITT OIL CORP., Beeville, Tex.; petroleum products; $5,000,000. Incorporators: R. H. Hawn, Refugio, Tex.; J. W. Kubuk and Lamar Folda, Beeville. Representative: Corporation Trust Co. of America, du Pont Bldg., Wilmington, Del.

PANAMA CITY TAR & TURPENTINE CO., Panama City, Fla.; turpentine and affiliated products; $10,000. A. M. Lewis, Panama City, heads the company.

ATHOL RUBBER CO., Detroit, Mich.; rubber products; $500,000. Incorporators: Hugo Miller, Clemens H. Davis, and Hugo Scherer, Grosse Pointe Farms, Mich.

STEPHENSON-MILLER LEATHER CO., New York, N. Y.; leather, $25,000. Incorporators: C. R. Stephenson, Sr. and Jr., and W. D. Millar. Representative: Woodward, Dennis & Buehler, 261 Broadway, New York.

FLORMAN PAINT CO., Amarillo, Tex.; paints and varnishes; $25,000. Incorporators: H., M. S., and L. Florman, all of Amarillo.

ROOT OIL CO., South Bend, Ind.; petroleum products; $300,000. Incorporators: Louis J. and H. J. Root, and Daniel S. Brooks, all of South Bend.

Industrial Notes

THE OILGEAR CO., of Milwaukee, Wis., manufacturer of hydraulic presses, broaching machines, variable delivery pumps and variable speed drives, has appointed the Cleveland Duplex Machinery Co., Inc., 1224 West 6th St., Cleveland, as its representative in the northern Ohio territory.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO., East Pittsburgh, Pa., announces that Ray P. Jackson, manager of the materials and process engineering department, and Marsden H. Hunt, ceramic engineer, will have charge of the new high-voltage insulator plant of the Westinghouse Co. at Emeryville, Calif., near San Francisco, which will be completed and operated in several months. Mr. Jackson will be manager of the new porcelain plant and Mr. Hunt will be superintendent.

THE EUREKA STEEL PRODUCTS CO., with temporary offices at 205 New England Life Bldg., Kansas City, Mo., has been organized by A. A. Kramer, John P. Harris and F. C. Buchanan, to manufacture a new acid- and corrosion-proof alloy "Akramium."

WILLIAM A. ROGERS has been elected chairman of the board of Rogers, Brown & Co., Buffalo, N. Y., manufacturers of pig iron, ferro-alloys, etc. Other officers elected were: William S. Rogers, president; Hugh Kennedy and C. R. Holzworth, vice-presidents; David G. Williams, treasurer, and Charles H. Byron, secretary. Mr. Holzworth was formerly general manager at the plant of the St. Louis Coke & Chemical Co., Granite City, Ill.

THE CHAIN BELT CO., Milwaukee, Wis., announces that Clifford F. Messinger, for the past 3 years general sales manager, has been elected second vice-president.

THE METAL & THERMIT CORP., New York, N. Y., has appointed Charles F. Lederer general supervisor of rail welding, to assume entire charge of all technical work in the field. This company also announces that the Pittsburgh branch will move May 1 to 1514 Fayette St., N. S. In order to take care of business a modern welding shop is now being constructed at the new quarters and will be equipped with facilities for making Thermit welding repairs and relining crucibles. A large stock of Thermit equipment and materials will be carried at all times.

THE LION OIL & REFINING CO., Kansas City, Mo., moved its traffic and car accounting departments on April 1 to its El Dorado, Ark., office and all work connected with these departments will be handled directly from El Dorado.

THE CHASE METAL WORKS, Waterbury, Conn., has added an Atlanta, Ga., office to its other sales offices. J. G. Weddington will have charge of the office, which is located at 304 Rhodes Bldg., Atlanta, Ga.

PERRY & WEBSTER, INC., New York, announces a reorganization. Robert S. Perry has acquired majority stock ownership together with direction of the management and control of the methods of doing business. A. W. Karnopp has succeeded as vice-president and chief engineer in place of P. W. Webster, who no longer has any executive connection with the business activities of the company.

THE LABOUR CO. is closing its office at 8 South Dearborn St., Chicago, and is moving to its own plant at Chicago Heights, Ill.

THE WALTER A. ZELNICKER SUPPLY CO., of St. Louis, Mo., which has been located for 20 years at 325 Locust St., has moved to the Chamber of Commerce Bldg., 511 Locust St.

RICHARDS & GEIER, of New York, patent and trademark attorneys, announce the following additions to their staff: Joseph Farley, formerly an assistant examiner in the U. S. Patent Office; Henry Ruhl, trademark specialist, and Fritz Zeigler, Jr., attorney and counselor-at-law.

THE MECHANICAL APPLIANCE CO., Milwaukee, Wis., has changed its name to the Louis Allis Co.

THE CUTLER-HAMMER MFG. CO., Milkaukee, Wis., announces that the Pittsburgh office of the central district will move May 1 from the Farmers Bank Bldg., to Rooms 950 to 953 Century Building. A. G. Pierce is manager.

Industrial Finances

WOLF OIL CORP., Bristow, Pa., increased capital from $1,000,000 to $3,000,000 for general expansion.

NEWAYGO PORTLAND CEMENT CO., Newaygo, Mich., increased capital from $945,000 to $1,695,000 for expansion.

EUREKA GLASS WORKS, INC., 85 Hope St., Brooklyn, N. Y., increased capital from $15,000 to $150,000 for expansion.

MONTGOMERY CHEMICAL WORKS, INC., Hamtramck, Mich., has filed notice of dissolution.

LIBERTY COTTON OIL MILL, INC., Clayton, N. C., increased capital from $120,000 to $300,000 for plant extensions and general financing.

STOLL OIL REFINING CO., Louisville, Ky., increased capital from $500,000 to $650,000 for proposed expansion.

EMKEN CHEMICAL CO., 14th St., Long Island City, N. Y., has filed notice of dissolution.

Receivers for the EASTERN POTASH CO., New York, N. Y., with plant in Raritan Township, near New Brunswick, N. J., are arranging for a reorganization of the company and payment in full to creditors. It is purposed to place the plant in operation.

KENNECOTT COPPER CORP., 120 Broadway, New York, N. Y., increased capital from $15,000,000 to $25,000,000, a portion of the proceeds to be used for securing a controlling interest in the Utah Copper Co., Salt Lake City, Utah.

PHILLIPS PETROLEUM CO., Bartlesville, Okla., increased capital from 1,000,000 to 2,000,000 shares of stock, no par value, for general extensions.

H. H. Taylor, First National Bank, Kinston, N. C., and A. L. Cavenaugh, Beulahville, N. C., have been appointed receivers for the SEMINOLE PHOSPHATE CO., Goldsboro, N. C., manufacturer of fertilizers.

DEVOE & REYNOLDS CO., INC., 101 Fulton St., New York, N. Y., manufacturer of paints, varnishes, etc., increased capital from $5,000,000 to $7,000,000 for general expansion.

WATERPROOFED PRODUCTS CO., Oakland, Cal., manufacturer of waterproofing compounds, metal-preversing paints, etc., has disposed of stock for $115,000 for plant expansion.

Receivers have been appointed for the CONSTANTIN REFINING CO., Tulsa, Okla. The local oil refinery will be continued in operation.

Coming Meetings and Events

AMERICAN ASSOCIATION OF CEREAL CHEMISTS will hold its ninth annual convention at Hotel Sherman, Chicago, June 4 to 9.

AMERICAN ASSOCIATION OF ENGINEERS will hold its annual convention in Norfolk, Va., May 7 to 9.

AMERICAN ELECTROCHEMICAL SOCIETY will hold its spring meeting May 3, 4 and 5, 1923, at the Commodore Hotel, New York.

AMERICAN ELECTROPLATERS SOCIETY will hold its eleventh annual meeting at Providence, R. I., July 2 to 5.

AMERICAN FOUNDRYMEN'S ASSOCIATION will hold a meeting in Cleveland, O., April 30 to May 3. The Institute of Metals will hold several joint sessions during this time.

AMERICAN GAS ASSOCIATION will hold its annual convention the week of Oct. 15 at Atlantic City. An elaborate exhibition of gas-making and gas-utilization equipment is planned.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS will hold its summer meeting June 20-23 at Wilmington, Del.

AMERICAN LEATHER CHEMISTS ASSOCIATION will hold its twentieth annual convention at the Greenbrier, White Sulphur Springs, W. Va., June 7, 8 and 9.

AMERICAN OIL CHEMISTS' SOCIETY will hold its annual meeting at the Eastman Hotel, Hot Springs, Ark., April 30 and May 1.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS will hold its spring meeting May 28 to 31 in Montreal, Canada.

AMERICAN SOCIETY FOR TESTING MATERIALS will hold its twenty-sixth annual meeting at the Chalfonte-Haddon Hall Hotel, Atlantic City, beginning Monday, June 25, 1923, and ending either Friday or Saturday of that week.

AMERICAN WELDING SOCIETY will hold its annual meeting April 25 to 27 at the Engineering Societies Building, New York.

AMERICAN ZINC INSTITUTE, INC., will hold its fifth annual meeting at the Hotel Chase, St. Louis, May 7 and 8.

CANADIAN INSTITUTE OF CHEMISTRY will hold its annual meeting in Toronto, May 29 to 31.

CHAMBER OF COMMERCE OF THE UNITED STATES will hold its eleventh annual meeting in New York May 7 to 11.

INTERSTATE COTTON SEED CRUSHERS ASSOCIATION will hold its annual convention at Hot Springs, Ark., May 2 to 4.

IRON AND STEEL INSTITUTE (London) will hold its annual meeting May 10 and 11 at the House of the Institution of Civil Engineers, London, S. W. 1.

NATIONAL ASSOCIATION OF MANUFACTURERS OF THE UNITED STATES OF AMERICA will meet in annual conference May 14 to 16, inclusive, at the Waldorf-Astoria, New York City.

NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES (NINTH) will be held in New York Sept. 17-22.

NATIONAL FERTILIZER ASSOCIATION will hold its thirtieth annual convention at White Sulphur Springs, W. Va., the week of June 11.

NATIONAL FOREIGN TRADE COUNCIL has postponed its annual conference from April 25, 26 and 27, to May 2, 3 and 4. It will be held in New Orleans, La.

NATIONAL LIME ASSOCIATION will hold its fifth annual convention at the Hotel Commodore, New York City, June 13 to 15.

NATIONAL SYMPOSIUM ON COLLOID CHEMISTRY will be held at the University of Wisconsin, June 12 to 15.

NEW JERSEY CHEMICAL SOCIETY holds a meeting at Stetters Restaurant, 842 Broad St., Newark, N. J., the second Monday of every month.

PACIFIC DIVISION, American Association for the advancement of Science, will hold its seventh annual meeting at the University of Southern California, Los Angeles, Sept. 17 to 20, in conjunction with the summer session of the national association and a meeting of the Southwestern Division of the National Association.

SOCIETY OF CHEMICAL INDUSTRY, Canadian Section, will meet in Toronto, May 29 to 31.

SOCIETY FOR STEEL TREATING — Eastern sectional meeting will be held June 14 and 15, in Bethlehem, Pa.

The following meetings are scheduled to be held in Rumford Hall, Chemists' Club, East 41st St., New York City: May 4—American Chemical Society, regular meeting. May 11—Société de Chimie Industrielle (in charge) American Chemical Society, American Electrochemical Society, Society of Chemical Industry, joint meeting. May 18—Society of Chemical Industry, regular meeting. June 8—American Chemical Society, regular meeting.